GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

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Editorial Notes.

Our Review, and Some Reflections.

WE would confess at once to a certain feeling of relief that this number of the "JOURNAL" will not reach the hands of our subscribers on the date which adorns its pages. Attached as we are to the familiar buff and bronze-blue, nevertheless we realize that it may appear somewhat incongruous among the "Christmas Numbers" and other outward and visible signs of the festive season. Even after the "JOURNAL" has found its way through the overladen post, the inward and spiritual man, attempting to enjoy a few days less strenuous than those which normally compose the gas engineer's week, will in all probability be disinclined to peruse its workaday pages. Therefore, quite apart from the necessity of going to press a day early and publishing a day late, it has not been an easy issue to prepare; but the date has supplied us with a reason for breaking with precedent and publishing our review of 1928 in the first number of the New Year. The review, further, will assume a novel form, in that specialists in the industry have been invited to deal with its various phases; and the result is a valuable compilation which not only throws into relief the features of the year which has hurried away, but indicates how the industry should set its sails for 1929.

As, however, particular branches of our industry's healthy growth are to be examined by experts in next week's "JOURNAL," we ourselves, at this close of year, may be permitted to touch upon a few personal matters, and indulge in a measure of generalization, together with a specific reference to the only really dull spot on the gas horizon. Perhaps "generalization" should be substituted by "impression," for to generalize nowadays on a year's activities of the gas industry would be to write a chapter so long as to embitter completely the seasonably charitable thoughts of our readers. Indeed, not only at holiday seasons, but at all times, we realize that brevity is the soul of wit, that the scientific meat tablet may contain as much nourishment as an entire ox; but alas! the implied ideal is hard of attainment. Interests are widening and interlocking to such a degree at the present time, technical associations are multiplying (their meetings appear to do so with startling fertility), and conferences tread so fast on one another's heels, that the problem of the conscientious Editor of a Trade Journal is complex indeed. Shall he face the task of benignly explaining to many an author that the paper is not going to revolutionize the industry? Shall he ruthlessly apply the blue pencil? Shall contributions get stale while comprehensive abstracts are made of them? No, he must employ a judicious mixture of these palliatives, and in his more harassed moments sympathize with his very good friend who at each rencontre expresses the desire that the whole Fleet Street staff of his favourite journal shall retire for a suitable period to some Southern Isle, while the gas industry lowers the pile of technical literature which has outstripped its powers of absorption.

The gas industry is now well over a hundred years old, and the "JOURNAL" is getting within measurable distance of its century. Both have, in fact, grown up together; and just as the industry has retained its youth, so does the "JOURNAL" endeavour to merit the same compliment. But in each case it is a youth backed by the experience of long years. The industry can point to continuously increasing vigour and usefulness with the passing of time; and the attitude of our readers emboldens us to advance the like claim on behalf of the "JOURNAL." With this issue we have reached our 3423rd number, and these have been published over a period of close upon eighty years. Within some two months that milestone will have been reached; and we are considering even now means of commemorating the event. In the very early days, of course, the "JOURNAL" constituted practically the only regular channel of information between one gas undertaking and another throughout the country. If, consequent upon the formation of national and other organizations, the Technical Press does not still hold this position, it is no less essential on that account. Progress was never so rapid, or changes so great, as is the case to-day; and the "JOURNAL" offers every means to those engaged, in this country and abroad, on the manufacturing and distribution sides of the industry—as does its vigorous offspring the "GAS SALESMAN" to those on the selling side—to keep themselves thoroughly well posted regarding the technical developments and current events. Cordial support on the part of its readers is necessary to the best service that such a publication is capable of affording. This we have been fortunate enough to enjoy to a remarkable degree in the past; but, taking "Co-Operation" as our motto, we are hopeful that we may be able still further to increase the value of the "JOURNAL" to its subscribers in the future.

Gathering Strength.

As for the year that has passed, we suggest that it might well be labelled a period of intensifying rationalization in the industry as a whole. From all quarters of the globe comes news of the rationalization of that industry or this service; and there is danger of the word becoming worn-out, so well does it express the post-war need for, in common parlance, "doing the only rational thing." Thus the coal industry of this country—under duress, to be sure—has begun an effort to set its house in order; and over-production, with its attendant fratricide, is being dealt with, hopeless pits are doing the obvious thing in shutting-down, capital and labour have discovered the possibility of sitting round the same table, and the Government are seeing what can be achieved for some of the

200,000 surplus miners who were the primary cause of the decline and fall of the coal industry.

A very different past and present attaches to the gas industry, yet it is seen to be engaged in adjusting itself to environment and furbishing-up its services. Only in the case of the gas industry the "urge" has come from within, and has not needed the pressure of successive Governments and the weight of public opinion to dislodge it from the pedestal of antiquated dogma. On the contrary, its evolution has been retarded by apathy in the only quarter which possesses the power to impede such a powerful and efficient machine as the gas industry of 1928; but more of this anon. How then has the industry sought to eradicate its weaknesses and fortify its position in an environment of intensified and often unfairly biased competition? In the first place, we think, by preaching the growing conviction that some measure of amalgamation or joint working among undertakings great and small is not only advantageous but essential to the continued progress of the industry. Of amalgamation there have been many instances during the year; and interesting statistics have emerged, particularly from the Harrogate scheme. Especially susceptible to the benefits of linking-up are the agricultural districts of East Anglia; and here the first stride has been taken by the absorption of the Woodbridge undertaking by Ipswich. A further proof of the great interest which Eastern Counties gas circles are taking in the matter was provided by the outstanding paper read by Mr. W. W. Townsend to the Southern Association in November. The impression he conveyed to his hearers was that there are enormous possibilities in joint working, but that schemes must be subjected to the closest scrutiny and mathematical examination, for the "snag" will not always be apparent. In other words, each case must be treated on its merits. As for the world's greatest exponent of gas amalgamation, the Gas Light and Coke Company, its purchase of the Grays and Tilbury Gas Company —already a fair example of high-pressure grid work—is of extreme interest. Also near the Metropolis, a significant uneasiness is observable in the tentacles of the Tottenham Company, which is taking over, as from Jan. 1, the Waltham and Cheshunt Company.

It is our firm conviction that it behoves every gas undertaking, great or small, in these Islands to take stock of its position and weigh the possibilities of approaching neighbours with a view to a little local rationalizing of the supply of gas. Length and breadth of view and an average allowance of enterprise would, we are convinced, in a great many cases result in enormous benefit to the contracting parties and to the industry—nay, the country —as a whole; and even if no concrete scheme resulted, there would still be the beneficent and heartening effect of co-operation. We know of one group of "smaller," yet go-ahead, undertakings, not twenty miles from London, whose administrators will testify to the benefits of unofficial liaison and joint consideration of the problems which confront them, with a particular bearing upon the future of the competing grid.

Another direction in which the gas industry is "doing the only rational thing" is in harmonizing the so-called "professional" and "trading" sections, between which there has existed, now for too many years, a barrier which the breath of good sense suffices to overthrow. It is not our custom to echo the Daily Press in saying "as we have continually urged" and "as suggested in our columns in 1902;" but we can claim to have advocated consistently the welding of all branches of the industry—even to the extent of establishing one central organization on the lines of the American Gas Association. Therefore the widening of the qualifications for Membership of the Institution and of the Southern Association was a welcome move, and one which can only result in still further enhancing the utility of those bodies. Simultaneously the Society of British Gas Industries has made a reconnaisance, and has decided that a consolidation of its position is advantageous. Thus the industry may expect to hear more frequently of the activities of the Society.

Further convincing evidence of the convergence of the two branches of the industry was to be found in 1928 in three great conferences, the first of which was the Carbonization Conference during the British Industries Fair. At this, the contributors of papers represented every section of the industry; and we ourselves have had striking testimony of the value of both papers and discussions by the world-wide demand for the reprints which we were privileged to make. The Fuel Conference is still so fresh in the minds of all that we mention it only as a further example of *entente cordiale* between the "profession" and the "trade." The same applies to the Annual Conference of the "B.C.G.A.," which always appeals to us as one of the outstanding events in the gas programme. At the York meeting in October, a joint session of the industry dealt with another salient feature of its rational evolution —namely, the question of charging differential rates for gas; but the matter remains *sub judice*, and we are not qualified to speak of the various points of view which emerged at the session. Suffice it to say it is widely hoped that the arrival of long-delayed legislation will give greater latitude in following a modern, and in most cases highly desirable, development.

Having already exceeded the brevity which earlier we promised our readers, we will only touch upon the two remaining phases which have been noted down. The first is the spirit of friendly co-operation which has grown-up in the past year between the gas and the coke-oven industries. The establishing of the Joint Committee was a step of high diplomacy; and the present atmosphere makes it possible for the industries to await the "Gas Grid Investigation" as collaborators rather than antagonists.

Our final note, before we turn to a less satisfactory matter, deals with the sales side; and we doubt the justice of including it, for the industry has been developing its commercial conscience for years. A particular effort has been made, however, during the past year; and we are able to record that here again the rational thing has been done in voting a considerably enhanced subscription to the "B.C.G.A." We would strongly urge, at the same time, that the excellent work of the Central Organization should not be depreciated by lack of local publicity, which in our opinion is still lamentably meagre in the majority of places.

And so we arrive at the dull spot on the gas horizon.

The Disappointment of the Year.

IF, in the year that is gone, some progress has been made towards educating the public in general, and Government circles in particular, to the urgent and vital necessity of bringing Gas Legislation up to date, the efforts of the industry have not been in vain. The process of education is painfully slow and laborious; but so urgent are the requirements of the industry that no endeavour must be spared to complete it. The difficulty in regard to the public arises largely from apathy. Gas is part and parcel of the daily life of millions of people who never give it a thought except when their gas bill is presented, or when they drop a coin into the prepayment meter, or when they have some cause for complaint. The conditions under which gas is manufactured and supplied do not interest them, and they know nothing of the legislative restrictions which loom so large in these conditions. This attitude of mind is doubtless a tribute to the efficiency of a service which regularly, cheaply, and satisfactorily supplies a daily necessity; but it must be dispelled if that efficiency and cheapness are to be maintained and increased. For unless the public can be brought to realize that their interests are being adversely affected by existing legislation, and thus be moved to bring pressure to bear upon their Parliamentary representatives, there is but little hope that the Government of the day, whatever party it may represent, will introduce legislation which appears to present no vote-catching possibilities. Fortunately it can be shown that the extension of the powers and facilities which gas undertakings at present exercise by virtue of existing legislation, and the cheapening of the procedure by which such additional powers and facilities can be obtained, must react upon the price of gas in a manner favourable to the consumer. There is therefore hope that the public may yet be brought to see that the demand of the industry to be freed from obsolete restrictions, and thereby be enabled to expand further, and on modern lines, is a demand which they should actively support.

No less important is the education of those in Govern-

ment circles. Much has already been done by the National Gas Council in informing Members of Parliament of the irritating situation; and many of them are fully alive to the need for new laws, and have indicated their intention to support the proposals which have been put forward in that regard. Nor do we anticipate anything but a speedy concurrence on the part of others as soon as they learn that their constituents want it. After all, the best means of safeguarding the interests of gas consumers is to take every possible step to remove from the path of undertakings the obstacles which impede their progress. For as the efficiency of the industry increases, so the benefits to shareholders and workers as well as to consumers must also increase, and there must also be a corresponding benefit, both direct and indirect, to the other industries of the country.

For years past the Board of Trade has been examining Special Orders and Private Bills received from undertakings all over the country. In these Orders and Bills the same clauses have appeared so often that they are now regarded as common form. Has it never occurred to the Board of Trade that time and expense would be saved, to the eventual benefit of consumers, by incorporating these clauses in an Act of general applicability, thus rendering unnecessary a multiplicity of individual Orders and Bills? If so, they have given no indication of the fact. Their view apparently is that it is for the industry to take the initiative; yet even when the National Gas Council's proposals for amending legislation were put forward in 1926, the Board did not assume the responsibility of introducing a Bill, although they expressed sympathy with practically all the proposals. The latter must needs be submitted to the National Fuel and Power Committee, and by them to the representatives of Local Authorities. Thus two-and-a-half valuable years have been lost, making it impossible to hope for a comprehensive measure within the lifetime of the present Parliament. That this is so is made clear by the fact that in answer to numerous questions put in the House of Commons after it assembled in the autumn, the President of the Board of Trade stated that there was no one more alive than he was to the need for Gas Legislation, as he had been working at the matter for the last two years and had repeatedly invoked the lack of Parliamentary time for the failure to introduce such a measure. In the meantime, the view was expressed in the House of Lords by Lords Astor and Gainford, for whose powerful intervention the gas industry is indebted, that as a temporary expedient a non-controversial Bill embodying the most urgent of the Council's proposals might well be introduced at once and passed without delay. The suggestion was gladly accepted by the Council—now almost despairing of any progress. But even this modest plea looked like passing unheeded till last week the Prime Minister, in answer to a question in the House, stated that the President of the Board of Trade was in communication with representatives of the gas industry with a view to ascertaining whether a non-controversial Bill could be drafted for introduction this Session.

We do not wish to speculate as to the reasons which lie behind a change of attitude which will, we hope, yield us some of the fruits of the two years' labour of the President of the Board of Trade. At the moment we are thankful for small mercies. It must not be forgotten, however, that a Bill framed to avoid discussion in the House of Commons must necessarily be an emasculated and fragmentary measure. Nor must the placing of such a Bill upon the Statute Book be regarded by those in authority as an excuse for postponing to the Greek Kalends the introduction of a comprehensive measure which is so vitally necessary. To those who know the facts, the position is still unsatisfactory to a degree. One of the country's most important industries puts forward proposals for setting its house in order. These proposals are admitted by the Board of Trade and other competent authorities to be in the main reasonable and necessary. Yet after nearly three years' delay, nothing but fragmentary legislation is in sight. That is why no opportunity must be lost of bringing to all concerned such a knowledge of the position as will make them press the Government to carry on to its logical conclusion the work to which it has so grudgingly set its hand.

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Details and illustrations will be found later in this issue of the unfortunate explosions which occurred in the Holborn district early last Thursday morning. Serious as were the consequences, there is reason for deep thankfulness that the occurrence did not take place later in the day, when the thoroughfares concerned would have been crowded with vehicular and pedestrian traffic. Various theories as to the cause have been discussed; but for anything definite in this direction, we shall have to await the investigation of the Commission appointed by the Home Office to inquire into the matter. The members of the Commission are: Mr. R. G. Hetherington, Deputy Chief Engineering Inspector under the Ministry of Health; Lieut.-Col. R. A. Thomas, a member of the Explosives in Mines Committee; and Mr. E. H. Taylor, Assistant Chief Engineer to the London County Council. The Commission have already made the statement that they are not concerned with any question of legal responsibility.

A Suggestion.

Meanwhile, there may be difference of opinion as to a suggestion put forward in "The Times" by Sir Bruce Bruce-Porter, who says: "The solid-tyred heavy lorries must constitute a serious danger in cities and towns. Main gas and water mains were laid during the days of horse transport, and their depth is not sufficient to protect them from vibration. All ferrous metals become brittle in time if exposed to jarring. The heavy vehicles passing along the streets often shake the older houses to their foundations, so what must be the effect on pipes laid down in the streets? Surely the time has arrived when all heavy vehicles using the streets of cities and towns should be shod with pneumatic tyres."

Who is for Berlin?

Those who are now recording next year's events in their new diaries should make a note of June 10 to 12. It is officially announced in the Dec. 15 issue of "Das Gas- und Wasserfach" that these days have been fixed for the Seventieth Annual General Meeting of the German Gas Association. It will be remembered that the meeting is to be held in Berlin, to fall within the period of the big gas exhibition which is to open in that city earlier in the year. The hope has been expressed in official German quarters that members of the Institution of Gas Engineers will be able to take part in the meeting on this occasion, and they are assured of a hearty welcome. Unfortunately the two meetings have usually clashed in recent years. We say without hesitation that the Exhibition will be well worth a visit, and we have no doubt that a very genuine welcome will be extended to those of our gas men who can make the trip. It is to be hoped that a large party will be organized, and take the opportunity of seeing for themselves what the gas industry is doing in Germany.

Thermal Output and Therms per Ton.

A penetrating analysis of the cost of gas production was contributed by Dr. E. W. Smith to the proceedings of the Second International Bituminous Coal Conference held in Pittsburgh last month. The facts are compiled in lucid manner in the paper, which is published in full in our issue to-day, and the author's interpretation of the results of reliable investigations which have taken into account all the factors influencing the cost of manufacture of the gaseous therm in continuous verticals, intermittent chambers, and horizontal retorts, is clearly expressed and will be of valuable service, as a source of reference, to our industry. Several important points are emphasized. Among the first which calls for attention is the relationship between thermal output of the plant and therms per ton of coal carbonized. At the annual meetings of many gas companies, and at the time when chairmen of committees review the year's progress, we still hear proud utterances to the effect that, compared with the preceding twelve months, there has been an increase in the therms per ton of coal carbonized. We have still to understand why this statement, standing alone, should afford any excuse for congratulation. Perhaps the lure of records, or the fascination of statistics,

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Those who are now recording next year's events in their new diaries should make a note of June 10 to 12. It is officially announced in the Dec. 15 issue of "Das Gas- und Wasserfach" that these days have been fixed for the Seventieth Annual General Meeting of the German Gas Association. It will be remembered that the meeting is to be held in Berlin, to fall within the period of the big gas exhibition which is to open in that city earlier in the year. The hope has been expressed in official German quarters that members of the Institution of Gas Engineers will be able to take part in the meeting on this occasion, and they are assured of a hearty welcome. Unfortunately the two meetings have usually clashed in recent years. We say without hesitation that the Exhibition will be well worth a visit, and we have no doubt that a very genuine welcome will be extended to those of our gas men who can make the trip. It is to be hoped that a large party will be organized, and take the opportunity of seeing for themselves what the gas industry is doing in Germany.

Thermal Output and Therms per Ton.

A penetrating analysis of the cost of gas production was contributed by Dr. E. W. Smith to the proceedings of the Second International Bituminous Coal Conference held in Pittsburgh last month. The facts are compiled in lucid manner in the paper, which is published in full in our issue to-day, and the author's interpretation of the results of reliable investigations which have taken into account all the factors influencing the cost of manufacture of the gaseous therm in continuous verticals, intermittent chambers, and horizontal retorts, is clearly expressed and will be of valuable service, as a source of reference, to our industry. Several important points are emphasized. Among the first which calls for attention is the relationship between thermal output of the plant and therms per ton of coal carbonized. At the annual meetings of many gas companies, and at the time when chairmen of committees review the year's progress, we still hear proud utterances to the effect that, compared with the preceding twelve months, there has been an increase in the therms per ton of coal carbonized. We have still to understand why this statement, standing alone, should afford any excuse for congratulation. Perhaps the lure of records, or the fascination of statistics,

is responsible. Whatever the cause, however, the simple statement is meaningless; for it has been sufficiently well established that it is cheaper to maintain a high throughput, with consequent low fuel consumption and lower therms per ton, than to aim at a greater gaseous thermal yield per ton of coal at a lower throughput. The effect on the price of the therm of labour and capital charges is small in comparison with the cost of the fuel required for carbonization. Dr. Smith observes that, to sacrifice efficiency for the purpose of saving a few pounds in wages is poor policy. Similarly, the small difference in ultimate capital cost per therm shows the importance of choosing a plant suitable for the particular circumstances in which it is to operate, rather than on the basis of cheapness.

Good Coke Implies Cheap Gas.

It is well known that the net cost of coal has the greatest bearing on the price at which gas can be made. This, of course, is one of the outstanding features of the figures presented by Dr. Smith. There can be no question that it pays to carbonize the cheapest coal; but it must be a coal which can be treated satisfactorily in the particular plant in use, and which produces a coke low in ash and commanding a ready sale at a reasonable price. The gas industry has been prone to accept as axiomatic the point of view that profits are made in the retort house; and we heartily agree with the author that this proposition now demands a corollary—that profits are lost outside the retort house. To our mind the greatest loss is occasioned by the unwarranted neglect of coke sales; and we believe that any steps taken to increase the market value of the industry's solid smokeless product, and enhance its popularity in the eyes of the public, are likely to be well justified. We also share the view of the author that future progress in the reduction of gas prices will largely depend on economic distribution, scientific mainlaying, and improved sales methods—in regard to both gas and coke. We call attention to one more interesting feature brought out by Dr. Smith's figures—that the credit for tar is in most cases sufficient to pay for the capital charges, the labour costs, and a portion of the fuel cost. The moral is obvious.

City and Guilds of London Institute.

The report of the work of the Department of Technology of the Institute for the session 1927-28 has just been published; and it is good to learn that many more students presented themselves for the examinations in Gas Fitting than was the case in the previous session—the numbers being 480 and 255 respectively. It is pointed out in the report that the new regulation in gas subjects, under which a candidate not having attended an approved course of instruction is required to have made application to the Institution of Gas Engineers before a fixed date for permission to enter for examination, was not observed by some candidates; but the difficulty arising from the first introduction of this and other regulations was satisfactorily overcome with the assistance of the Gas Education Committee of the Institution, and will doubtless disappear in future years as the conditions of entry become better known. The following figures relating to examination results are interesting. In the Minor Course in Gas-Works Practice, there were 16 candidates, of whom 6 failed to satisfy the examiners. In the corresponding course in Gas Supply Practice, there were 71 candidates, but no fewer than 43 (60·5 p.ct.) failed to pass the examination. As already mentioned, in Gas Fitting, 480 candidates presented themselves; and of this number, approximately 60 p.ct. were successful.

Castles and Gas-Works.

In a leading article bearing this title, the "Yorkshire Post" has nothing to say in favour of gas-works from the point of view of appearance; but this would also have been the case, no doubt, had the writer been referring instead to the modern factory, or even to some of the working-class dwellings. A few years ago, if we remember rightly, there were on the outskirts of Leeds rows and rows of back-to-back houses which were dreadful to look upon; and they may still be in existence. No such good excuse can be urged on their behalf (for they could have been made attractive) as for a gas-works, which can hardly be made to look other than it is—a strictly utilitarian proposition. We have seen factories uglier than any gas-works; and there are processes less pleasing than the carbonization of coal. But they must continue in operation if England is to maintain her greatness. Entrance fees to castle ruins, levied upon visitors from abroad, would form a sadly inadequate exchange for this country's exports of manufactured goods.

The Beauty Spoilers.

Our friends the electricians, in their anxiety to come to the aid of the rural population, strongly resent any opposition, on the score of destruction of beauty, to their hideous overhead transmission paraphernalia; and when the countryside is festooned with wires, and studded with gigantic clothes-props, a gas-works here and there must be admitted to be comparatively inoffensive. After placing in the pillory "the materialistic engineers of the exuberant early days of railways and gas-works, who destroyed much beauty, both of Nature and of art, to impose their admittedly useful but seldom admirable creations in their places," the "Yorkshire Post" leader writer cites the case of Richmond Castle, North Yorkshire, a corner of which, he says, "was wholly destroyed to make room for the retorts and holders of the gas-works—a type of engineering perhaps the ugliest that has ever been devised." He then concludes: "The Pharisee's thanksgiving is often dangerous; but at least our generation can offer thankfulness that we are gradually rising above the ignorance and depravity of the age of our great-grandfathers—in such matters at least." Dear, dear, what will our overhead-transmission-line enthusiasts say to this?

Falling Trades Union Membership.

The latest official figures—those for 1927—which have just been published by the "Ministry of Labour Gazette," show a reduction of 5·7 p.ct. in the membership of trades unions and trades union federations in that year as compared with 1926; the actual figures being 4,908,000 for 1927 and 5,207,000 for 1926—a reduction of 299,000. The total number of unions in existence at the close of 1927 was 1127, as compared with 1136 twelve months earlier. The largest decrease is to be found under the heading of mining and quarrying unions, the membership of which fell off during the year by no less than 107,000. The railway service comes next, and lower down in the list is general labour, with a decrease of 25,000. The last-named group, which had the largest membership of all in 1920, had lost nearly two-thirds of its numbers by the close of 1927. Compared with 1913, the total 1927 membership showed an increase of over 750,000, the only groups exhibiting a decrease being mining and quarrying 240,000 and cotton 18,000.

"F.B.I." and "Black Smoke."

Under the Smoke Abatement Act of 1926, local authorities are empowered to frame by-laws for the purpose of smoke abatement. A standard by-law for black smoke was drafted by the Minister of Health, providing that the emission of two minutes' black smoke in the aggregate during any half-hourly period should be regarded as a nuisance under the Act. The Federation of British industries protested against this; and the Minister of Health ordered an inquiry to consider an application by the Bradford Corporation. The findings of this inquiry have now been issued. For the West Riding area, a three minutes' period has been provided instead of the two minutes provided by the standard draft by-law. The Federation appeared at the inquiry, and urged that, before any period was determined, it was essential that a definition of what constitutes black smoke as a nuisance should be laid down. The Minister has declined to adopt this view, and the Federation have lodged a strong protest against his attitude, and at the same time have sent a notice to all their members warning them that any authority may ask for confirmation of a local by-law adopting two minutes as the standard period. They are advised, therefore, to watch carefully the proceedings of their local authority.

PERSONAL.

PRESENTATION TO MR. P. S. HOYTE.

Mr. P. S. HOYTE, M.I.Mech.E., was the guest of the Directors of the Plymouth and Stonehouse Gas Light and Coke Company at a luncheon held at the Grand Hotel on Dec. 18, on the occasion of his retirement from the position of Chief Engineer.

Mr. J. H. ELLIS (Chairman and Managing Director), in proposing the toast of his health, expressed the sincere appreciation of the Board for the admirable manner in which he had performed his important duties, and particularly for his strenuous and successful efforts in surmounting the grave difficulties with which he was faced during the war and the industrial disputes of 1921 and 1926. The output of gas had practically trebled during Mr. Hoyte's association with the Company, and he had been responsible for remodelling and modernizing the works and distribution departments to meet the increased demand. The fact that the Company were able to supply gas relatively cheaper than before the war—having regard to altered money values—must be a source of pride to him.

Mr. T. G. GREEK WILLS, J.P. (Deputy-Chairman), seconded, and the toast was drunk with enthusiasm.

The CHAIRMAN then presented Mr. Hoyte with a solid silver tea service bearing the following inscription:

> Presented to P. S. Hoyte, Esq., by the Plymouth and Stonehouse Gas Light and Coke Company on his retirement from the position of Chief Engineer after 29 years' service in that capacity, and a total service of 34 years; with the best wishes of the Directors, and as a mark of their appreciation and regard. Nov. 5, 1928.

Mr. HOYTE, in thanking the Chairman and Directors, expressed his appreciation of the assistance he had always received from the Directors and staff in the almost complete reconstruction of the works which had taken place since the war. He added that, though he was relinquishing an active part in the control of the undertaking, it would always be a pleasure to him to assist the interests of the Company.

MURDOCH LODGE No. 3480.

The Worshipful Master, W.Bro. William A. Twine, presided at the December meeting of the Murdoch Lodge, which was held on Dec. 13 at the Imperial Hotel, Birmingham.

The Lodge having been duly opened, and the routine business disposed of, Bro. Geoffrey A. Peppercorn was advanced a degree. Subsequently Mr. Chas. Bernard Wallace was initiated into the Order. Both ceremonies were performed by the W.M.

The Senior Warden, Bro. R. J. Meiklejohn, was elected W.M. of the Lodge for the year 1929-30.

W.Bro. H. V. Stanton, I.P.M., proposed that a P.M. Jewel be presented to the retiring Master (W.Bro. Twine) as a mark of the brethren's respect and esteem.

At the close of the Lodge, the brethren and visitors dined together. During the evening an excellent musical programme was arranged between the usual toasts.

FORTHCOMING ENGAGEMENTS.

Jan. 5.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Newport. Paper by Mr. Kelvin Jones, on "Coal Tar."

Jan. 5.—WESTERN JUNIOR GAS ASSOCIATION.—Meeting. Paper by Mr. W. Rogers, on the "Tankless Holder."

Jan. 5.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the works of the Tottenham District Light, Heat, and Power Company.

Jan. 9.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to Messrs. Sawer & Purves. Paper by Mr. T. Davis, on "Distribution with relation to the Selling Price of Gas."

Jan. 12.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Joint Meeting with Western District at Glasgow. Paper by Mr. C. Chapman, Provan Chemical Works, Glasgow, on "Tar."

Jan. 16.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

Jan. 17.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Halifax. Paper by Mr. J. W. Denton, on "High-Pressure Governors and Plant." Inspection of the Halifax Gas-Works.

Jan. 21.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Dinner and dance at the Grand Hotel, Birmingham.

Jan. 25.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. C. A. Masterman, on "The Thermal Insulation of Gas Consuming Apparatus."

Jan. 26.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. Peebles & Co., Ltd., Tay Works, Bonnington, Edinburgh.

INSTITUTION OF GAS ENGINEERS' EDUCATION SCHEME.

Examinations in Gas Engineering and Gas Supply, 1929.

We are informed by Mr. Walter Hole, the Organizing Secretary of the Institution of Gas Engineers' Education Scheme, that the 1929 Examinations in Gas Engineering and Gas Supply have been arranged as follows:

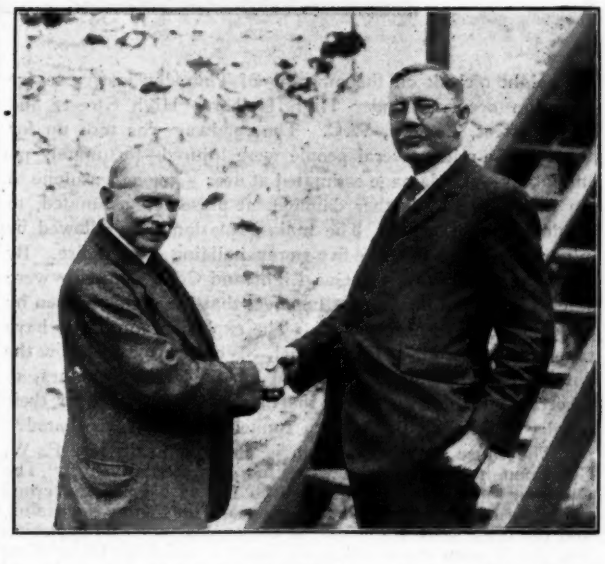
Ordinary Grade Gas Supply (external candidates)—Saturday, April 27, 2 p.m. to 5 p.m.

Higher Grade Gas Supply and Diploma (all candidates)—Saturday, April 27, 2 p.m. to 5 p.m., and 6 p.m. to 9 p.m.

Ordinary Grade Gas Engineering (external candidates)—Saturday, May 4, 2 p.m. to 5 p.m.

Higher Grade Gas Engineering and Diploma (all candidates)—Saturday, May 4, 2 p.m. to 5 p.m., and 6 p.m. to 9 p.m.

HALF-A-CENTURY OF SERVICE.



Mr. S. J. Ingram (right), Managing Director of the Truro (Cornwall) Gas Company, congratulating Mr. William McLean, who has completed 50 years with the Company, and is still "going strong."

World Engineering Congress in Japan, 1929.

With reference to the Congress which will be held at Tokyo between Oct. 29 and Nov. 22, 1929, by the Kogakkai, or Engineering Society of Japan, and supported by the Japanese Government, a conference of representatives of twenty-three Institutions and Societies (including the Institution of Gas Engineers) was held at the Institution of Civil Engineers recently to consider the best means by which British representation at the Congress could be organized. As a result, "The British Committee on the World Engineering Congress in Japan" was formed, having its Secretariat and place of meeting provided by the Institution of Civil Engineers. The Committee has as its objects: (*a*) The organization of a party of British engineers to attend the World Engineering Congress at Tokyo; and (*b*) the securing of a number of papers on engineering subjects for presentation at that Congress. In order to examine in detail the means by which the objects of the Committee may be furthered, a small Executive Committee has been formed. The Congress will be the first of its kind held in Japan; and it is evident that the Japanese, with their usual energy, are making every effort to render the Congress worthy of the progress achieved in that country. It is, therefore, the earnest wish of the Committee to awaken the interest and enlist the support of all engineers, so as to ensure adequate British representation at the Congress by the presence of a large party of delegates, and by the presentation of a number of papers.

Institution of Heating and Ventilating Engineers.—An election for membership to the Institution is due to take place at an early date, and intending applicants should send in their proposal forms to the Secretary, 12, Russell Square, W.C. 1, not later than Jan. 10.

EXPLOSION IN BLOOMSBURY.

At eight o'clock on the morning of Thursday last, a severe explosion occurred under High Holborn, High Street, and Broad Street, London, W.C. The roadway was torn up for about half-a-mile, several people were injured—fortunately no one fatally—and damage estimated at over £50,000 was done to the roadway, and further damage, at present unestimated, to neighbouring property. The main explosion was followed by minor ones, and a large five-storey building caught fire. By midday on Saturday, the Gas Light and Coke Company were able to issue a statement to the effect that the mains broken by the explosion had been cut off. The explosion appears to have taken place in a Post Office tunnel. What caused it is now the duty of Commissioners, appointed by the Home Secretary, to ascertain. One of the points that has been suggested for their inquiry is: Is the Post Office tunnel sufficiently ventilated?

"The cause of the explosion is obscure," said Mr. F. W. Goodenough in an interview with a representative of "The Observer" on Saturday last. "So far as we are concerned we know of no cause. All the escapes of gas from the mains, and the fires, were the result of the explosion. The explosion was due to some cause unknown, and for which we know of no responsibility on our part. The explosion caused the upheaval of the ground, which damaged our mains and caused serious escapes of gas. We have no evidence whatever," he added, "that it was the traffic that led to this trouble. And we have no evidence of escaping gas. What gas it was that exploded in the Post Office tunnel we do not know. The tunnel contains no gas pipes. Coal gas is not the only gas that will explode. The tunnel in which the explosion occurred runs all along under the streets affected, causing the disturbance of the ground that broke our mains."

The official announcement issued by the Home Office on Saturday last was as follows:

> The Commissioners appointed by the Home Secretary to inquire into the circumstances of the recent explosions in the neighbourhood of New Oxford Street are Mr. R. G. Hetherington, O.B.E., M.Inst.C.E., Deputy Chief Engineering Inspector under the Ministry of Health; Lieut.-Col. R. A. Thomas, C.B.E., one of his Majesty's Inspectors of Explosives, and a member of the Explosives in Mines Research Committee; and Mr. E. H. Tabor, M.Inst.C.E., Assistant Chief Engineer of the London County Council.

The Gas Light and Coke Company, who, on Dec. 20, stated that they recognized no responsibility for the accident, issued the following statement on Sunday, Dec. 23:

> The Directors of the Gas Light and Coke Company are glad to be in a position to state that by midday Saturday the mains broken by the explosion had been cut off. Immediately the escapes of gas had been stopped the Company proceeded to give supplies of gas to all their consumers in the district who had been temporarily deprived of it.

BRITISH INDUSTRIES FAIR.

Gas Industries Section.

An excellent proof of the vitality of the Gas Industry and of the desire of its members to seize upon any legitimate means for extending business and usefulness is afforded by the enthusiasm with which support has been forthcoming to ensure the success of the Gas Industries Section at the British Industries Fair, Birmingham, and the Gas Conference which will be held in the Fair Conference Hall during the period of the exhibition.

A meeting of the Exhibition Committee was held at the Offices of the Society of British Gas Industries on Monday, Dec. 10, when Mr. R. J. Rogers, the Hon. Secretary for the Gas Industries Section, was able to report that the whole of the 20,000 sq. ft. of stand space allotted to the Section had been taken up, and that greater stand space would have been booked by several of the exhibiting firms if this had been available.

The Fair Authorities are providing a Conference Hall which is to be erected adjacent to the main Fair Buildings. This will be surrounded by those outside exhibits which will form a feature of next year's Fair, and which will give accommodation to some of the many firms who have been unable to secure inside space in the various sec ions. Every foot of stand area throughout the Fair Buildings has now been taken up, and all signs point to a record attendance of buyers.

A joint conference under the auspices of the National Gas Council, the Institution of Gas Engineers, the British Commercial Gas Association, and the Society of British Gas Industries has been arranged, and is being organized by a Joint Committee under the Chairmanship of Mr. John Terrace, President of the Institution.

PRELIMINARY PROGRAMME.

TUESDAY, FEB. 19.

10.30 a.m.	Assemble at Conference Hall, British Industries Fair, Castle Bromwich. Opening of Conference.
11. 0 a.m.	Paper by Mr. R. J. Milbourne, Assoc.M.Inst.C.E., F.C.S., on "Gasholders," to be followed by a discussion.
1. 0 p.m.	Luncheon at the British Industries Fair (delegates paying for their own luncheon).
Afternoon.	Inspection of exhibits at the Fair.
5. 0 p.m.	Meeting in the Conference Hall of the General Committee of the British Commercial Gas Association.

WEDNESDAY, FEB. 20.

10.15 a.m.	Assemble at Conference Hall, British Industries Fair.
10.30 a.m.	Paper by Mr. Stephen Lacey, B.Sc., Assoc.M.Inst.C.E., on "Gas Appliances—Testing and Maintenance." Discussion.
1. 0 p.m.	Luncheon in Royal Dining Room, by invitation of the Fair Management Committee.
Afternoon.	Inspection of exhibits at the Fair.

THURSDAY, FEB. 21.

10. 0 a.m.	Assemble at the Birmingham Midland Institute, Small Lecture Theatre.
10.15 a.m.	Lantern slides and description of the latest gas-heated industrial appliances by Dr. C. M. Walter. An invitation to this meeting will be extended to the Industrial Gas Salesmen's Circle of the "B.C.G.A."
10.45 a.m.	Adjourn to 'buses which will be provided for visits to works using the industrial appliances described by Dr. Walter.
1. 0 p.m.	Luncheon in the Conference Hall, British Industries Fair (delegates paying for their own luncheon). The Association of Public Lighting Engineers, who are paying an official visit to the Fair on this day, will be invited to attend the luncheon.
Afternoon.	Inspection of exhibits.

Members wishing to attend are strongly advised to apply immediately for accommodation to the Reception Department of the British Industries Fair, Chamber of Commerce, New Street, Birmingham, stating what accommodation is required, and whether a boarding-house would be acceptable if hotel accommodation cannot be secured.

Accommodation will be very limited, and it is most important that immediate application should be made.

Free admission tickets to the Fair and railway vouchers at reduced rates will be available.

"The Times" are issuing during the Fair a special Trade Supplement relating to the British Industries Fair; and in this we hope to see due reference to the Gas Industries Section.

A STUDY OF COMPARATIVE COSTS OF GAS PRODUCTION IN THE RETORT HOUSE.

By E. W. SMITH, D.Sc., F.I.C.

[Paper before the Second International Conference on Bituminous Coal, Pittsburgh, Nov. 23.]

In the following paper an attempt is made to study the comparative importance of the various factors influencing the cost of gas production in the retort house.

INTRODUCTION.

The cost of gas manufacture is a factor of supreme importance to the gas engineer. A number of factors influence the cost of production, but these factors have not the same measure of importance. At the present day the gas engineer has a number of varying factors. He has different types of carbonizing plant to choose from; he has different grades of coal which he can treat; under the Gas Regulation Act he can choose the calorific value of the gas he has to distribute. In many cases, by alteration in throughput of his plant, he can increase his thermal output at the expense of therms per ton. Concerning all these variations, the question is naturally asked, "What is the effect on the cost of gas per therm?"

The published returns of the gas undertakings furnish little information on this important subject. In order to determine, therefore, the comparative importance of the various factors influencing the cost of gas production in the retort house, the basis of the present study is to make a number of reasonable assumptions, and then to vary these assumptions. The results of the study are contained in a series of tables.

GAS PRODUCTION IN CONTINUOUS VERTICAL RETORTS.

VARIATION IN THROUGHPUT AND THERMS PER TON.

In Table I. are given the comparative costs of gas production in continuous vertical retorts making 510 B.Th.U. gas, showing the effect of variation in throughput on therms per ton and the percentage of fuel used. It is known that by variation in throughput a higher thermal yield of gas may be obtained, but this is usually obtained at the expense of a higher fuel consumption in the producers. When treating a typical gas coal at a throughput equivalent to 0·100 ton per inch retort major axis per day, 78 therms of 510 B.Th.U. gas may be expected with a fuel figure of 14 p.ct. This set of conditions is shown in Column B, Table I.

TABLE I.—*Comparative Costs of Gas Production. Continuous Vertical Retorts.*

(510 B.Th.U. Gas.)

[Variation in Throughput and Therms per Ton.]

	All Figures Pence per Therm.		
Scheme No.	A	B	C
Throughput, tons per inch major axis per day	0·106	0·100	0·094
Therms per ton	77	78	79
Fuel, p.ct. on weight of coal	13	14	15
Therms per inch retort major axis per day	8·16	7·80	7·43
Coal cost	3·430	3·385	3·340
Capital	0·293	0·308	0·324
Labour	0·110	0·116	0·122
Fuel	0·445	0·475	0·500
Total	4·278	4·284	4·286
Less Gross coke	2·451	2·421	2·390
Tar	0·713	0·705	0·696
Surplus steam	0·257	0·270	0·290
Final net cost per therm.	0·857	0·888	0·910

Assumptions.—Coal cost, 22s. per ton; coke value, 22s. per ton; capital cost, £250 per ton at 8-ton throughput; capital charges and maintenance, 10 p.ct. per annum; working days per annum, 250; gross coke yield, 71·5 p.ct.; tar yield, 11 gallons per ton at 5d. per gallon; steam value, 20d. per 1000 lbs.

By reducing the throughput, a higher thermal yield can be obtained at the expense of a higher fuel consumption. The table is based on a number of assumptions which are set out at the foot of the table. The capital cost item includes foundations, waste-heat boilers, coke and coal handling plant within the retort house, and the building of the necessary retort house, and is based on a plant treating (say) 400 tons per day. The capital charges and maintenance in this table and throughout the rest of the paper are taken as equivalent to 10 p.ct. on 250 maximum working days per annum. This figure, it is considered, is sufficient to pay interest on the money, and maintain the plant for an unlimited period at full efficiency. The same basis is taken for all the comparative figures. The value of recovered steam is taken as 20d. per 1000 lbs., which is considered as a reasonable figure.

Consideration of this table will show that the cheapest gas is made by obtaining high thermal output per inch of retort major axis per day, with consequent low fuel consumption, at the expense of high therms per ton of coal. Put in other words, it is cheaper to keep a high throughput, with consequent low fuel consumption and lower therms per ton, rather than to aim at a higher thermal yield per ton of coal at a lower throughput.

The other factors which are noticeable, and which will be discussed at a later stage, are that labour and capital charges are small in comparison with fuel cost.

VARIATION IN THROUGHPUT AND CALORIFIC VALUE.

Table II. shows the effect on cost per therm of working a continuous vertical retort plant at maximum thermal output per day, but reducing calorific value by steaming. In these circumstances the therms per ton increase from 76 to 90, while the calorific value drops from 500 B.Th.U. per c.ft. to 450 B.Th.U. per c.ft., and the throughput falls from 0·106 to 0·085 tons per inch major axis per day.

TABLE II.—*Comparative Costs of Gas Production. Continuous Vertical Retorts.*

[Variation in Throughput and Calorific Value.]

Scheme No.	All Figures Pence per Therm. A	B	C	D
Calorific value	520 B.Th.U.	500 B.Th.U.	480 B.Th.U.	450 B.Th.U.
Throughput, tons per inch major axis per day	0·106	0·100	0·093	0·085
Therms per ton	76	80	84	90
Tar, gallons per ton	11	12	13	14
Fuel, p.ct. on weight of coal	13	14	15	16
Therms per inch retort major axis per day	8·05	8·00	7·80	7·65
Coal cost	3·475	3·300	3·140	2·932
Capital	0·297	0·300	0·310	0·314
Labour	0·115	0·116	0·119	0·121
Fuel	0·451	0·462	0·467	0·469
Total	4·338	4·178	4·036	3·836
Less Gross coke	2·487	2·325	2·182	1·970
Tar	0·724	0·750	0·774	0·778
Surplus steam	0·270	0·246	0·224	0·186
Final net cost per therm	0·857	0·857	0·856	0·902

Assumptions.—Coal cost, 22s. per ton; coke value, 23s. per ton; capital cost, £250 per ton at 8-ton throughput; capital charges and maintenance taken at 10 p.ct. per annum; working days per annum, 250; gross coke yield, 71·5 p.ct. at 520 B.Th.U.; steam value, 20d. per 1000 lbs.

The fuel consumption, based on the weight of coal charged, increases with the fall in calorific value; but due to the fact that the therms per ton increase almost proportionately, there is no variation in the cost of fuel per therm. The interesting fact comes out that, as long as the plant is being worked at maximum thermal output, there is little variation in the cost per therm—a negligible alteration in comparison with the final selling price per therm.

It will be noted that the capital and labour charges increase as the calorific value drops. The credit for surplus steam also drops considerably because of the larger amount of steam which is required per therm. Tables III. and IV. show the steam balance under the conditions of operation as discussed in Tables I. and II.

VARIATION IN VALUE OF COKE.

It will be noted that Tables I. and II. assume that the coal cost and coke value are the same. This, it is suggested, is a very close approximation to truth; but it may be raised that, should the value of coke vary relatively to the value of coal,

TABLE III.—*Steam Balance. Continuous Vertical Retorts.*

(510 B.Th.U. Gas.)

—	Scheme A.	Scheme B.	Scheme C.
Throughput, tons per inch major axis per day	0·106	0·100	0·094
Therms per ton	77	78	79
Fuel, p.ct.	13	14	15
Lbs. fuel per therm	3·80	4·02	4·26
Gross steam per therm allowing for fan, lbs.	17·1	18·1	19·2
Steam for steaming, lbs. per therm	3·5	3·4	3·4
Steam for producers, lbs. per therm	1·1	1·2	1·3
Net surplus steam per therm, lbs.	12·5	13·5	14·5
Value of surplus steam at 20d. per 1000 lbs., pence.	0·257	0·270	0·290

TABLE IV.—*Steam Balance. Continuous Vertical Retorts.*

[Variation in Calorific Value.]

—	Scheme A.	Scheme B.	Scheme C.	Scheme D.
Calorific value, B.Th.U.	520	500	480	450
Throughput, tons per inch major axis per day	0·106	0·100	0·093	0·085
Therms per ton	76	80	84	90
Fuel, p.ct.	13	14	15	16
Lbs. fuel per therm	3·84	3·93	4·00	4·00
Gross steam per therm allowing for fan	17·3	17·7	18·0	18·0
Steam for steaming, lbs. per therm	2·7	4·2	5·6	7·5
Steam for producers, lbs. per therm	1·1	1·2	1·2	1·2
Net surplus steam, lbs. per therm	13·5	12·3	11·2	9·3
Value of surplus steam at 20d. per 1000 lbs., pence.	0·270	0·246	0·224	0·186

the deductions made from the first two tables would be fundamentally altered. Tables V. and VI. are included to elaborate this point.

TABLE V.—*Comparative Costs of Gas Production. Continuous Vertical Retorts.*

[Variation in Cost of Coke.]

Scheme No.	All Figures Pence per Therm. A_o	A	A_1
Coal cost	3·430	3·430	3·430
Capital	0·293	0·293	0·293
Labour	0·110	0·110	0·110
Fuel	0·323	0·445	0·567
Total	4·156	4·278	4·400
Less Gross coke	1·782	2·451	3·120
Tar	0·713	0·713	0·713
Surplus steam	0·257	0·257	0·257
Final net cost per therm.	1·404	0·857	0·310
Coal per ton	22s.	22s.	22s.
Coke per ton	16s.	22s.	28s.

Carbonizing conditions as A, Table I.

TABLE VI.—*Comparative Costs of Gas Production. Continuous Vertical Retorts.*

[Variation in Cost of Coke.]

Scheme No.	All Figures Pence per Therm. C_o	C.	C_1.
Coal cost	3·340	3·340	3·340
Capital	0·324	0·324	0·324
Labour	0·122	0·122	0·122
Fuel	0·326	0·500	0·637
Total	4·112	4·286	4·423
Less Gross coke	1·740	2·390	3·040
Tar	0·696	0·696	0·696
Surplus steam	0·290	0·290	0·290
Final net cost per therm	1·386	0·910	0·397
Coal per ton	22s.	22s.	22s.
Coke per ton	16s.	22s.	28s.

Carbonizing conditions as C, Table I.

Table V. is based on exactly the same data as given under Scheme A, Table I.; but two extra schemes are put in with this. In all three schemes, the coal price is kept at 22s. per ton; but in Scheme A_o, coke is regarded as being worth

16s. per ton; in Scheme A, 22s. per ton; and in Scheme A_1, 28s. per ton. Similarly, in Table VI., the carbonizing conditions are as in Scheme C, Table I.; but here again, though the coal value per ton is kept constant at 22s., the coke value per ton is varied as follows:

Scheme C_0	16s. per ton
,, C	22s. ,,
,, C_1	28s. ,,

It will be found on study of these two tables that the relationship A/C or A_0/C_0 or A_1/C_1 are all of the same order. In other words, the comparative A Schemes all give cheaper gas than the comparative C Schemes. These tables also bring out the great importance of coke value per ton. When coke fetches a poor value, the importance of fuel consumption is less than when coke fetches a good figure.

GAS PRODUCTION IN INTERMITTENT VERTICAL CHAMBERS.

Table VII. shows the comparative costs of gas production with intermittent vertical chambers making 540, 510, and 480 B.Th.U. gas. It will be seen that Schemes B and C with intermittent vertical chambers correspond with Scheme B, Table I., and Scheme C, Table II., respectively, relating to continuous vertical retorts.

TABLE VII.—*Comparative Costs of Gas Production. Intermittent Vertical Chambers.*

	All Figures Pence per Therm.		
Scheme	A	B	C
Cycle, hour	10	12	15
Calorific value, B.Th.U.	540	510	480
Therms per ton	72	78	84
Fuel consumption, p.ct.	14·5	16	17·5
Tar, gallons per ton	10	11	13
Coal cost	3·668	3·385	3·140
Capital	0·310	0·344	0·400
Labour	0·105	0·116	0·134
Fuel	0·532	0·540	0·550
Total	4·615	4·385	4·224
Less Gross coke	2·622	2·421	2·182
Tar	0·684	0·705	0·774
Surplus steam	0·200	0·100	0·070
Net cost per therm	1·109	1·159	1·198

Assumptions.—Coal value, 22s. per ton; coke value, 22s. per ton; capital cost, £280 per ton; capital charges and maintenance at 10 p.ct. per annum; working days per annum, 250; tar, 5d. per gallon.

It will be noticed that there is a slight tendency for increased cost per therm when making low calorific value gas in intermittent vertical chambers than when making high calorific value gas. Fuel consumption on intermittent vertical chambers is higher than that of continuous vertical retorts; and in addition to this, the credit for surplus steam is less. Capital cost per therm is slightly higher than that for continuous verticals. These factors result in the net cost of gas per therm usually being higher in intermittent vertical chambers than in continuous vertical retorts.

GAS PRODUCTION IN HORIZONTAL RETORTS.

Table VIII. shows the cost of gas production for horizontal retorts. In this case, the thermal yield, fuel percentage, tar yield, &c., are taken from Mr. Thomas Hardie's paper to the Institute of Fuel, 1926 ("Fuel Economist," December, 1926—also extract in the "JOURNAL" for Dec. 15, p. 692). The labour is taken as being the same per ton of coal carbonized as in continuous vertical retorts, which leads to a slightly higher labour cost per therm of gas made in horizontal retorts. (See Hardie, Presidential Address, Southern Association Gas Engineers, March, 1927—"JOURNAL" for April 6 of that year.) The capital cost is taken as £260 per ton, which, including cost of retort house and waste-heat boiler, is believed to be a favourable figure for horizontals. The amount of excess steam is also based on the same figures published by Mr. Hardie. It will be seen that the final cost per therm works out slightly higher than the cost of making gas in intermittent vertical chambers.

TABLE VIII.—*Comparative Costs of Gas Production. Horizontal Retorts.*

	All Figures Pence per Therm.
Calorific value, B.Th.U.	540
Therms per ton	72
Fuel, p.ct.	15
Coal cost	3·668
Capital	0·347
Labour	0·126
Fuel	0·550
Total	4·691
Less Gross coke	2·622
Tar	0·660
Surplus steam	0·222
Final net cost per therm	1·187

Assumptions.—Coal cost, 22s. per ton; coke value, 22s. per ton; capital cost, £260 per ton; capital charges and maintenance at 10 p.ct. per annum; gross coke yield, 71·5 p.ct.; tar yield, 9·5 gallons per ton; steam value, 20d. per 1000 lbs.

COMPARISON BETWEEN VARIOUS SYSTEMS OF CARBONIZING PLANT.

Table IX. shows the comparative costs of gas production in various types of carbonizing plant. Continuous vertical retorts are shown making 510 B.Th.U. gas and 480 B.Th.U. gas; intermittent vertical chambers making 540, 510, and 480 B.Th.U. gas; horizontal retorts making 540 B.Th.U. gas. In considering this table, it is to be remembered that in each case the following items are the same:

(1) Coal cost 22s. per ton.
(2) Coke value 22s. per ton.
(3) Tar value 5d. per gallon.
(4) Capital charges and maintenance, 10 p.ct. per annum.
(5) Working days 250 per annum.
(6) Value of surplus steam, 20d. per 1000 lbs.

TABLE IX.—*Comparative Costs of Gas Production.*

[Various Carbonizing Systems.]

—	All Figures Pence per Therm.					
	Continuous Vertical Retorts.		Intermittent Vertical Chambers.			Horizontal Retorts.
Calorific value B.Th.U. per c.ft.	510	480	540	510	480	540
Therms per ton	78	84	72	78	84	72
Fuel consumption, p.ct.	14	15	14·5	16·0	17·5	15
Tar, galls. per ton	11	13	10	11	13	9·5
Coal cost	22s.	22s.	22s.	22s.	22s.	22s.
Coke value	22s.	22s.	22s.	22s.	22s.	22s.
Coal cost	3·385	3·140	3·668	3·385	3·140	3·668
Capital charges	0·308	0·310	0·310	0·344	0·400	0·347
Labour	0·116	0·119	0·105	0·116	0·134	0·126
Fuel	0·475	0·467	0·532	0·540	0·550	0·550
Total	4·284	4·036	4·615	4·385	4·224	4·691
Less Gross coke	2·421	2·182	2·622	2·421	2·182	2·622
Tar	0·705	0·774	0·684	0·705	0·774	0·660
Surplus steam	0·270	0·224	0·200	0·100	0·070	0·222
Net cost of gas per therm	0·888	0·856	1·109	1·159	1·198	1·187
Data from	Table 1 Scheme B	Table 2 Scheme C	Table 7 Scheme A	Table 7 Scheme B	Table 7 Scheme C	Table 8

(*a*) The cheapest gas is made in continuous vertical retorts, followed by intermittent vertical chambers, and then by horizontal retorts.
(*b*) The variation between the highest and the lowest cost of production is not more than one farthing per therm.
(*c*) Intermittent vertical chambers have a higher fuel consumption than continuous vertical retorts when making the same calorific value gas.
(*d*) Continuous vertical retorts give a greater yield of surplus steam than intermittent vertical chambers when making the same calorific value gas.

THE RELATIVE IMPORTANCE OF THE VARIOUS FACTORS GOVERNING THE COST OF GAS PRODUCTION.

Table IX. gives an opportunity of studying the relative importance of the various factors governing the cost of gas production.

CAPITAL COST.

Consideration of this item shows that the highest capital cost is found with intermittent vertical chambers making 480 B.Th.U. gas, with a charge of 0·400d. per therm, and the lowest with continuous vertical retorts making 510 B.Th.U. gas, with a charge of 0·308d. per therm. When making 540 B.Th.U. gas, horizontal retorts show a slightly greater capital charge than intermittent vertical chambers; the figures being 0·347d. and 0·310d. per therm respectively. The small difference in ultimate capital cost per therm shows the importance of choosing a plant suitable for the particular circumstance in which it is to operate, rather than on the basis of cheapness. To give an example, on an installation to make 6 million c.ft. per day, an extra £20,000 in original capital cost affects the cost of gas only to the extent of 0·06d. per therm.

LABOUR COST.

The weekly wage bill is one of those tangible expenses on which it is possible to economize; but it is to be remembered

that the labour cost per therm is a very small item in the retort house. Labour cost varies from 0·134d. to 0·105d. per therm in the figures considered (Table IX.). To sacrifice efficiency for the purpose of saving a few pounds in wages is poor policy.

FUEL COST.

Fuel cost is one of the most important items in the cost of gas production. Consideration of Table IX. will show that fuel cost is approximately three times as important as labour. Therefore every effort should be made to keep fuel consumption low. There are three means by which the fuel account may be kept down:

(*a*) By having producers of ample capacity.
(*b*) By staffing the producers with sufficient labour to ensure regular attention.
(*c*) By having the installation suitably insulated to prevent loss of heat by radiation.

In connection with fuel cost it must be remembered that modern carbonizing plants are provided with waste-heat boilers which give a valuable credit to the process. It is the net fuel cost (*i.e.*, fuel to producers *less* value of surplus steam produced) which is of importance in determining final cost of gas per therm. The net fuel costs under the various schemes as set out in Table IX. are given below:

Net Fuel Cost per Therm of Gas.

—	Pence per Therm.
Continuous vertical retorts at 510 B.Th.U. gas .	0·205
,, ,, ,, ,, 480 ,, ,, .	0·243
Intermittent ,, chambers at 540 B.Th.U. gas .	0·332
,, ,, ,, ,, 510 ,, ,, .	0·440
,, ,, ,, ,, 480 ,, ,, .	0·480
Horizontal retorts at 540 B.Th.U. gas	0·328

To obtain a picture of the relative importance of the three factors of capital, labour, and fuel on the conditions as set out in Table IX., the following statement may be of use. It will be found that—

(*a*) 16 p.ct. extra capital expenditure on the original plant;
(*b*) 40 p.ct. extra labour in running the plant;
(*c*) 10 p.ct. extra fuel (*i.e.*, increase in fuel figure from 14 p.ct. to 15·5 p.ct. on weight of coal);

all have an equal effect on the final cost of gas manufacture per therm.

COAL.

In all methods of carbonization the cost of coal is by far the most important item. By suitable regard to the coke market, it is, however, usually possible to obtain a credit of from 50 to 70 p.ct. of the coal value in the form of coke. It is outside the scope of the present study to discuss in detail coal cost, for in all the tables coal price has been kept constant. The effect of the relationship between coal and coke value has been discussed in Tables V. and VI. Generally speaking, it pays to use the cheapest available coal which

(*a*) can be carbonized satisfactorily in the plant;
(*b*) produces a satisfactory coke with a reasonable ash content.

TAR.

The importance of tar is shown on Table IX. It may not be generally realized that the credit for tar is sufficient to pay for capital charges, labour, and a portion of the fuel cost. This shows the necessity of ensuring that the maximum return is obtained from the tar by careful marketing in crude form, or, alternatively, by its conversion into dehydrated tar or distillation products.

COKE.

The figures shown in the various tables emphasize the great importance of coke. It will be noted that throughout the fuel cost has been debited as a working expense, and the full credit given for the entire production of coke. It will be seen with particular reference to Tables III. and IV. that any steps which increase the quantity and market value of coke are likely to be very well justified.

The production of good coke reasonably free from ash and moisture, and screened into several suitable sizes, with a good sales organization, is a most important factor in the production of cheap gas.

CONCLUSION.

The most significant point which this study brings out is that the carbonizing conditions may be varied over wide limits without making any large difference in the final cost per therm. It is probably a statement of fact that at the present time the average selling price of gas in London, including the industrial load, is over three times the cost actually involved in the preparation of the crude gas. If this is the case, there is surely a lack of true perspective in straining unnecessarily to cut the capital cost of a new installation, when one which is to cost £20 per ton capacity more may be more efficient to run and give a better lay-out for the particular circumstances. The same thing applies to the tendency to operate a plant with the absolute minimum of labour, often at the cost of the efficiency of the plant.

The gas industry has rather accepted the point of view that "profits are made in the retort house." At the present time this proposition seems to demand a corollary that "profits are lost outside the retort house." The problems of economic distribution, scientific mainlaying, and improved methods of the sale of gas and coke would appear to be lines in which there are far greater opportunities of saving money than there are in the modern retort house.

I have pleasure in acknowledging the assistance I have received from Mr. T. Campbell Finlayson, M.Sc., in the preparation of this paper.

MOISTURE IN COAL AND COKE AND ITS INFLUENCE ON THE CARBONIZING PROCESS.

Moisture in coal, whether from the pit, or acquired subsequently by washing or from storage in the open, has its definite influence upon the capacity of carbonizing plant. Dr. Erich Dubois, of Krefeld, has made some interesting calculations and observations on the subject and upon moisture in coke, which were embodied in an article in "Das Gas- und Wasserfach," Aug. 18, 1928. The following is an abstract translation.

The results of the recent investigations of Terres and Wolter, who were able to give reliable figures for the heat units required to coke various coals, form the basis upon which the author made his calculations. The results are striking, and are of importance for regulation of working methods. A moisture content of 2 p.ct. is taken as the normal, and this is the figure which is included in the standard guarantee of the German oven manufacturers. Washed nuts usually contain a higher percentage of moisture, and washed smalls, which are being more and more used by gas-works to improve coke quality, contain usually upwards of 10 p.ct. of moisture.

Let it be assumed that an oven, with a 2 p.ct. moisture coal, has a throughput for a given time of 10 tons, and a gas make of 400 cub.m. per ton—*i.e.*, 4000 cub.m. per day. If a similar coal, but with 6 p.ct. of moisture, is used in the same oven, and is introduced at (say) 10° C., there are required for the vaporization of each kilogramme of water 639 − 10 = 629 k.cals. To this must be added also the heat required for superheating the water vapour to the temperature at which the gases leave the oven. This, of course, varies according to the type of carbonizing plant in use, whether chamber oven, horizontal, or vertical retort. Assuming an average superheating of 150°, there would be required 75 k.cals. per kilo. of water. The total heat applicable to the moisture only is, therefore,

$$629 + 75 = 704 \text{ k.cals. per kilo.}$$

According to the results of the most recent investigations, the heat required to coke an average Ruhr gas coal is about 350 k.cals. per kilo., at a working temperature between 960° and 1079° C. The striking conclusion is that, with the heat units required to deal with one kilo. of moisture above normal in the retort, 2 kilos. of normal coal could be carbonized.

Supposing an oven to have been constructed for a throughput of 10,000 kilos. (10 metric tons) of normal coal. If it is charged with 6 p.ct. moisture coal, then the charge, of equal volume, will be increased in weight by the moisture to 10,408 kilos. If the dimensions of the oven, the producer, the burners, and the gas flues are designed for the carbonization of 10,000 kilos. of normal coal in 24 hours, they will not suffice to deal with 10,408 kilos. of the coal with 6 p.ct. of moisture. The available heat units will, on the contrary, be able to deal only with

$$10{,}000 - 2 \times 408 = 9184 \text{ kilos. normal coal}$$

in addition to the 408 kilos. of water, and, as the gas make is estimated upon the throughput of normal coal, it will be reduced in the proportion of 10,000 : 9184, or by 8·16 p.ct. The make per unit of weight will be reduced as 10,000 : (9184 + 408), or by 4·08 p.ct. In the case of charges which cannot be varied in volume, these effects will be manifest in the longer carbonizing period required. In the case of variable charges—as, for example, in horizontal retorts—the charge can be diminished with the high-moisture coal, and the coking period remain the same.

According to the investigations of Terres and his colleagues, many coals are far more easily coked than the Ruhr coal used

for the above calculations. For instance, Maybach gas coal at 1041° requires only 235 k.cals. per kilo., estimated on a normal ash content of 6 to 7 p.ct. A typical best Durham gas coal gave a result of only 249·4 k.cals., which, of course, gives a still more unfavourable picture of the heat units wasted in vaporizing the moisture; it being in this case nearly three to one per unit weight of water and normal coal respectively, instead of only two to one with the Ruhr coal.

Some of the effects of varying degrees of excessive moisture are estimated and set-out in Table I., which is for a coal requiring 235 k.cals. per kilo., and having, consequently, a "ratio" figure of 3·0 for vaporization of the moisture.

TABLE I.

Moisture Content of Crude Coal.	Water to be Vaporized to Give a 2 P.Ct. Moisture Coal.	Reduction in Throughput Capacity of Oven.	Reduction in Gas Make of Oven.	Necessary Carbonizing Period Increased from 12 Hours by—
P.Ct.	Kilos. per 100 Kilos.	P.Ct.	P.Ct.	Hrs. Min.
2	0·0	0·0	0·0	0 0·0
3	1·020	2·04	3·06	0 22·0
4	2·041	4·08	6·12	0 44·1
5	3·061	6·12	9·18	1 6·1
6	4·082	8·16	12·24	1 28·1
7	5·102	10·20	15·31	1 50·2
8	6·122	12·24	18·37	2 12·2
9	7·143	14·29	21·43	2 34·3
10	8·163	16·33	24·49	2 56·3
11	9·184	18·37	27·55	3 18·4
12	10·204	20·41	30·61	3 40·4
13	11·224	22·45	33·67	4 2·4
14	12·245	24·49	36·73	4 24·5
15	13·265	26·53	39·80	4 46·6
16	14·286	28·57	42·86	5 8·6
17	15·306	30·61	45·92	5 30·6
18	16·326	32·65	48·98	5 52·7
19	17·347	34·69	52·04	6 14·7
20	18·367	36·73	55·10	6 36·7

1 k.cal. per kilo. = 1·7995 B.Th.U. per lb.

The author next deals with the effect of moisture in the coal upon producer fuel requirements, from the point of view of standard guarantees given by German manufacturers; the quantity of extra fuel required being, of course, dependent upon the efficiency of the oven

THE EFFECT OF MOISTURE IN COKE.

In small works, where coke is often unscientifically quenched, it may easily contain upwards of 20 or 30 p.ct. of moisture. In any case, it is not easy to keep down to anything like 10 p.ct. the moisture in the smaller gradings, which are being more and more used in producers. In outside or central producers, little heed need be paid to moisture contents up to about 30 p.ct., as the sensible heat of the producers suffices for its vaporization. This, however, is not the case with built-in producers, where the sensible heat should go entirely to the credit of the oven, and be effective in considerably raising the burner temperature. Any other call on the sensible heat is equivalent to a lowering of the burner temperature, and, consequently, to impairing the efficiency of the plant. In addition to this, any moisture expelled from the coke has to go forward as ballast in the producer gas, and be heated up in the burners, which again impairs their efficiency.

To arrive at some estimate of the effect upon the combustion temperature, in a given example the theoretical combustion temperatures were calculated for various moisture contents in the fuel—viz., 0, 10, 20, and 30 p.ct., reckoned on wet coke. A producer gas was taken analyzing:

CO_2	6 p.ct.	CH_4	0·4 p.ct.
CO	28 ,,	O_2	0·3 ,,
H_2	10 ,,	N_2	55·3 ,,

Cal. value net . . . . { 1139 k.cals. per cub.m. / 128 B.Th.U. per c.ft.

From 1 kilo. of coke with 11 p.ct. of ash are produced 4·35 cub.m. (70 c.ft. per lb.) of dry gas at N.T.P., representing a producer efficiency of 0·726, reckoned on cold gas. The results are given in Table II.

The values in Column 3 are estimated under the assumption that the producer gas burns with 20 p.ct. excess of air, and has besides a water vapour ballast of 58 grammes per cub.m., due to the undissociated portion of the steam injected under the grate. Column 4 gives the difference in combustion temperature as compared with the highest obtainable with dry coke. Actual combustion temperatures are considerably lower than the theoretical, and it should be noted that, in taking optical measurements, it is the temperature of the walls at glow-heat, and not actually the flame, that is measured. Also, in estimating the theoretical flame temperature, no allowance is made for the dissociation of the water vapour at the high temperature. In column 5, therefore, a difference of 35 p.ct. is assumed. The influence upon carbonizing period and oven capacity can only be grasped by realizing the effective temperature head between burner temperature and that of the interior of the chamber or retort. The latter must be in the neighbourhood of 1000°, at any rate towards the end of the process, to effect complete carbonization. Therefore, the effective temperature head with dry coke is 400°, and it drops to 318° with a 30 p.ct. moisture content, as is seen in Column 7. This and Column 8 give the best idea of the harmful effect of moisture in the coke.

Even in the most favourable circumstances the effect is harmful—namely, in producers where only the sensible heat of the gas is affected, and the quality is not changed, by moisture in the coke. Such, for instance, are the built-in producers of ovens with sufficient depth which are fed at short intervals, so that there always remains a good layer of incandescent coke to reduce the primary carbon dioxide to monoxide. In such producers, the moisture is vaporized only by the sensible heat of the producer gas rising from below, and by the radiant heat of the upper coke layer and the arch. In cases, however, where there is insufficient depth, the newly fed coke draws heat for the vaporization of its moisture from the reducing zone proper, so that there is incomplete reduction of the carbon dioxide, and the calorific value of the producer gas is considerably diminished. The author considers that the lower temperatures usually noticeable immediately after the clinkering and feeding of producers are very largely attributable not so much to the entry of cold air through the open doors as to a temporary lowering of the quality of the producer gas in consequence of its having to carry an excessive water vapour ballast from the cold and wet coke.

The influence of water vapour in the producer gas also tends to increase losses in the shape of waste heat. Since, with increasing moisture in the coke, there are increased quantities of water vapour in the waste gases, the heat units in the waste gases from 1 cub.m. of producer gas are greater, given equal temperatures at the inlet to the recuperator, while the quantity of secondary air to be heated remains the same, as it is dependent only upon the composition of the gas in dry state. Likewise the final temperature of the secondary air remains unchanged in these circumstances, so that the heat-absorbing capacity of the secondary air remains the same as for drier waste gases. The result is that a greater quantity of sensible heat is unabsorbable, and goes to waste. It does not follow that such theoretical increases in waste gas temperatures will always be obvious in practice, as, with decreasing combustion temperatures, the temperature at which the waste gases enter the recuperators will be lower, and the theoretical differences balanced out. In this case, however, the decreased preheating of the secondary air would still affect the efficiency of the oven in another way.

It is impossible in practice to evolve a formula which will cover the effect of excessive moisture in coke upon all sorts and conditions of carbonizing plant. According to the normal guarantees in use in Germany, 600 k.cals. per kilo. (1080 B.Th.U. per lb.) of water to be vaporized are allowed, but this, the author is convinced, is totally insufficient in any case. He strongly advocates that every effort should be made to limit the moisture in the producer coke to 10 p.ct., and the ash to 25 p.ct. In this case the figure of 1000 k.cals. per kilo., which has been adopted as normal by the German Gas Institute, should not be exceeded.

TABLE II.—*Reduction in Combustion Temperature in Built-In Producer due to Moisture in Coke.*

1	2	3	4	5	6	7	8
Moisture in Coke. P.Ct.	Water Vapour Contents of Producer Gas. Grammes /m³.	Theoret. Combustion Temperature with 20 P.Ct. Excess Air. Net Cal. Value 1139 k.cals.	Reduction in Theor. Combustion Temperature.	Temp. in Practice. 35 P.Ct. below the Theoretical.	Reduction in Actual Temperature.	Effective Temp. Head to 1000°.	Reduction in Temp. Head. P.Ct.
0	0	2151°	..	1400°	..	400°	..
10	26	2117°	34°	1378°	22°	378°	5·5
20	58	2076°	75°	1351°	49°	351°	12·3
30	99	2025°	126°	1318°	82°	318°	20·5

1 gramme per cub.m. = 0·437 grain per c.ft.

THE RATIONAL CLEANING OF COAL.

By R. LESSING, Ph.D., F.I.C.

[From a Paper presented and discussed at the Annual Meeting of the Institute of Fuel on Nov. 21.]

The preparation of coal for the market is mainly concerned with the removal of its ash-forming components. It may be contended that the other form of its preparation—viz., the subdivision of coal into various sizes by screening—is of a greater actual importance, inasmuch as a larger tonnage of coal is submitted to this treatment than to cleaning operations. It must, however, be remembered that the question of size is not unconnected with that of ash content.

The preference of the coal buyer for large or "round" coal has its origin in the fact that its size is an implied guarantee of its purity, or at any rate of its freedom of those mineral constituents which form lines of weakness along which coal is broken during mining, handling, and transport.

The original methods of firing coal, both for domestic and for industrial uses, were based on the cheap supply of such large and, therefore, comparatively clean coal. The tendency during the present century has been in the direction of utilizing smaller coal, a tendency which has been pressed to its logical conclusion in the application of coal in dust form; and most remarkable and greatly improved combustion efficiencies are now realized. It so happens that this tendency coincides with the modern development of coal mining, which of necessity has to deal with poorer seams, and yields more small coal on account of blasting and machine cutting.

It is not yet sufficiently realized, either by the coal producer or by the consumer, that such small coal possesses the advantage of containing in the slack or duff sizes a very clear and ash-free coal, and that the free dirt particles, which impart to the slack or duff their high mean ash content, are present merely in mechanical admixture.

The methodical examination of the distribution of mineral matter in coal is of comparatively recent date. Until a few years ago coal cleaning was carried on without sufficient consideration for the true composition of the coal and the distribution and chemical composition of its ash-forming constituents. The author showed in 1920 that the ash in the main constituents of banded bituminous coal—fusain, vitrain, clarain, and durain—is of an amount and a composition characteristic for each component (1), and, further, (2) that the distribution of mineral matter throughout its components varies in both quantity and composition according to the size of particle. It may be said that this recognition forms the key to new work, revealing new facts and establishing old ones on a sound scientific basis. The results and their significance were discussed in a number of papers which should be referred to in the original publications (2-12).

The principal outcome of these researches was that clarain and vitrain, the "bright" coal constituents, have an ash content not exceeding 1·5 or 2 p.ct., of a chemical composition which makes it tolerably certain that this ash forms the remains of the original plant ash. Durain, the "dull" coal constituent, has a higher ash content, which is composed of almost pure clay substance. It represents the argillaceous mud, intermingled and deposited with comminuted plant particles or small plant entities such as spores, &c., which is intimately mixed with the coal substance, and gives durain its characteristic hardness. On account of its close and uniform association with the coal substance, the ash of durain cannot be removed by ordinary washing or cleaning processes, and must be regarded as inherent ash.

Fusain, the peculiar charcoal-like constituent of bituminous coal, is different from the other coal constituents, in the composition of both its carbonaceous and its mineral matter. The latter consists mainly of the suspended and dissolved solids deposited from water which percolated the fusain intrusions during and after fusainization by infiltration into the coal seam. This mineral matter consists, therefore, largely of the carbonates of lime and iron, together with a small amount of clayey matter, originally suspended in the percolating water.

The fusain, by reason of its friability, is almost entirely in the form of dust in the coal brought to the surface, except for portions which remain occluded in unbroken lumps of coal. This dust is mixed with the dust formed by the more friable portions of the clarain and durain, together with the dust of shale and other minerals. It presents its own peculiar problems in cleaning operations, and is responsible for the formation of slurry in wet washing and of dust in dry cleaning processes, introducing in both cases considerable difficulties in handling and recovery, and interfering with the production of a clean coal of good appearance and low ash content. The presence of this dust is responsible for difficulties in draining the excess water off the washed coal, and makes the preparation of a product of a reasonably low free-moisture content impossible. Recently, these difficulties have led to the screening-out of dust from slack to be washed; but in order to make screening practicable, a fair amount of clean coal above true dust size is allowed to pass the screen, while rather high percentages of dust still remain in the coarse mixture to be submitted to washing. On the Continent pneumatic removal of dust has been practised of late, but a close "cut" between true dust and the larger particles of small coal has not been attempted.

Coal washing processes, with few exceptions, depend on the separation of the specifically lighter coal from the heavier dirt in a current of water. This is done either in a continuous current of water, as in trough washers, or in pulsating bodies of water, as in jig washers and on concentrating tables.

The difficulty of draining the washed coal to a reasonable free moisture content has led to the adaptation for the dry cleaning of coal of pneumatic cleaning processes, such as had been employed for other materials—particularly grain, flour, coffee, &c.

Except in the special processes referred to, in which the difference in specific surface properties of coal and refuse, such as friction or wetting power, are made use of, the separation of coal and free dirt depends, in both wet and dry cleaning, on at least two factors, specific gravity and size, by which the rate of bodies falling or rising in such media as water or air, both lighter than the material, are determined.

According to the laws governing the phenomena involved, a large particle of clean coal and a small particle of refuse—for instance, in a size ratio of 5 to 1—would travel in water in the same direction and practically at the same velocity.

The two particles, though discrete and free to move away from each other, would not part company, but would find their way together either into the "clean" coal product or into the refuse. In consequence a sharp separation is impossible, and a certain amount of dirt will always be present in the coal, and some coal in the refuse.

A good deal of mathematical evidence has been adduced in explanation of the phenomena involved, and the formula enunciated by Rittinger, and Stokes' law of bodies falling in water, are freely used in their theoretical consideration. As these laws only hold good for true spheres, and require certain constants to render them applicable to cubes or other shapes, their value is considerably diminished when the differences in shape of clean coal particles and shale particles assert themselves, and still more when, as in the case of fusain, the porosity of the particles introduces difficulties on account of adsorbed air, which affects the buoyancy of the particle.

The dependence of ordinary washing and dry cleaning processes upon two factors is responsible for the comparative inefficiency of such processes in regard to the production of truly clean coal with a minimum of loss. While experience has made it possible for such old-established washing plants as the jig washer to dispense with a complicated system of grading, sizing within very close limits is still necessary in most successful dry cleaning processes; but it may be confidently stated that in no existing commercial process can a coal containing only inherent ash be produced without considerable loss of such coal in the refuse portion.

These considerations led the author to investigate some years ago the possibilities of devising a commercial method depending on a single factor as the separating criterion. The most attractive line of investigation appeared to be a separation by specific gravity only. The difference in specific gravity of coal and shale has been used in the laboratory for many years for the differentiation between these two materials by the so-called float-and-sink test. This method is now widely used for the control of washeries, and for the examination of coal before and after washing. If a coal is submitted to the float-and-sink test at different specific gravities, washability curves can be constructed which demonstrate the yield of products, and their ash content theoretically obtainable at any given density of the separating fluid. The fluids used are either aqueous solutions of inorganic salts, such as calcium chloride, zinc chloride, and others, or organic liquids, such as mixtures of carbon tetrachloride and petroleum ether, as suggested by the author (2).

COMMERCIAL GRAVITY SEPARATION.

The application of the float-and-sink method on an industrial scale presented some formidable difficulties. Problems of the complete removal of the density liquid from the coal, its quantitative recovery after use, and its likely corrosive action upon the plant were anticipated. The fascinating possibility of being able to separate all cleanable coal from raw coal, regardless of size, so that it would contain a minimum of ash, was a sufficient inducement to devote a very great amount of research and experimental work to the subject.

After the preliminary work in the laboratory, the Clean Coal Company, Ltd., took up this investigation; and a semi-com-

mercial plant capable of treating about two tons of coal per hour has been in operation during the last three years. This unit has been used for the collection of data, upon which the design of commercial plants has been based, and for the examination of coal in 10 or 20 ton lots.

The first commercial unit was erected at the Yniscedwyn Colliery of Amalgamated Anthracite Collieries, Ltd., and has been in operation for some time, dealing with 20 tons per hour of anthracite duff of a size $\frac{3}{16}$ in. to 0.

PRINCIPLES OF THE PROCESS.

The characteristic properties of the fusain and other coal dust indicated that its removal before gravity separation would be desirable, and steps were taken right from the beginning to effect the de-dusting of the coal to be treated. It was, however, not foreseen how thorough this de-dusting had to be, in order to make possible ready drainage of a somewhat viscous density liquid. Preliminary experiments had shown that all dust below 1/100 in. (50 I.M.M. mesh) should be removed. To begin with, a content of 5 p.ct. of such dust in the coarse coal was fixed as a permissible limit. It was, however, soon found that the coarse coal had to be much more free from dust in order to give good draining results, and it is now considered desirable to keep the dust content down to 0·5 or 0·25 p.ct.

The dust recovered is, for the reasons given above, not amenable to cleaning; and as it is of a size directly utilizable in powdered fuel installations, its obvious use lies in that direction.

In this connection it must be remembered that in Great Britain 10 to 20 million tons per annum of such natural dust are raised with the coal, and only require separation and collection to be ready for coal dust firing without further grinding or other preparation.

The gravity separation of the de-dusted coal calls for little comment. Inasmuch as this separation is carried out on the de-dusted material, it is scientifically much more accurate than the ordinary laboratory float-and-sink test carried out on raw coal without dust removal, for it should be remembered that the great majority of float-and-sink tests are vitiated by contamination with this dust, the bulk of which is not amenable to gravity separation.

Ordinarily a calcium chloride solution of suitable specific gravity is used as the separating fluid, but it can be replaced wholly or in part by other liquids when it is desired to modify the density, viscosity, or other properties. From the commercial point of view the crux of the process is the removal of the calcium chloride solution from the coal and refuse, and its recovery in a form suitable for re-circulation through the process. The removal of even the last traces of calcium chloride from the product does not any longer present difficulties. In fact, it is our usual experience that coal which naturally contains chloride gives a considerably lower chloride test after having passed through the process than before; the original salt being washed out along with the calcium chloride.

The clean coal and refuse suspended in the solution are placed in draining hoppers; the solution is allowed to run off, while water is super-imposed upon it, so that a very methodical washing takes place. The bulk of the solution is recovered in its original strength while a very small layer of weak liquor is interposed between the strong liquor at the bottom and the clean water at the top. This weak liquor is passed through an evoporator before being put again into circulation. A small portion of solution, so dilute that it does not stand the cost of concentration, is run to waste until water free from added chloride passes out. The calcium chloride lost in this manner usually amounts to no more than the equivalent of about $\frac{1}{2}$ gallon of strong calcium chloride liquor per ton of coal.

DESCRIPTION OF PLANT.

The plant consists of three main sections: The removal of dust by air separation, the gravity separation, and the re-concentration of liquor.

AIR SEPARATION.

When this work was begun, a number of existing types of air separators were tried, with little success. They were not able to treat a sufficient tonnage to comply with the requirements of ordinary commercial coal-cleaning plants, nor did they even approach the limit set for the degree of freedom of dust of the coarse coal or for the fineness of the dust capable of immediate use in coal dust burners.

A new type of air separator was therefore worked out and submitted to extensive trials. Its advantages are: A closed system free from external dust troubles; a sharp cut between dust and coarse coal; small ground space required; and low power for running. The apparatus is designed to give the correct velocity of air at every point of the system, and is automatically controlled to compensate for variations in the coal feed and the speed of fan.

In order to allow for the production of a coarse product as free as possible from dust, and at the same time to produce fines having the correct screen analysis for coal dust firing, a portion or portions of medium size are taken out of the primary system of the air separator and retreated in a secondary unit of suitable dimensions, where a final separation into coarse and fines takes place.

The fines produced are either pumped directly to coal dust fired colliery boilers, or are loaded into special coal dust wagons for transport to customers' installations, where they are discharged by means of compressed air.

GRAVITY SEPARATION.

The dust-free coal is elevated into a bunker over the gravity separator, into which it is fed through two or more chutes and feeder tubes. Where dust-free nuts are to be cleaned, these may be charged into the gravity separator together with the dust-free slack or duff, or else they may be treated in another unit.

The separating vessel consists of a cylindrical vessel with a conical base and a rectangular top; the size being determined in accordance with the throughput required. The raw coal is introduced through the sides of the vessel by means of feeder tubes, provision being made for the rapid detachment of the particles from each other, and their distribution across the separator. The rate of feed of the coal is controllable, but it may be pointed out that the efficiency of the separation does not depend on a uniform feed, as is the case with all other processes.

The particles of coal of low ash content immediately rise in the separating liquor to the top of the vessel, and are skimmed off continuously by means of a conveyor of the scraper type, and transferred, together with any excess of liquor, into a screw conveyor, which delivers the clean coal and liquor into one of three or four draining hoppers. Some of the liquor used for feeding the raw coal overflows through a grid at the top of the vessel, and is re-circulated by means of a centrifugal pump. The excess liquor which overflows and passes to the drainers with the clean coal is replaced by fresh calcium chloride liquor drawn from a stock tank.

The refuse sinks to the bottom of the separator and passes into the boot of an elevator mounted in a liquor-tight casing. This elevator delivers the refuse into one of two drainers similar to those used for draining the clean coal. The clean coal and refuse drainers consist of cylindrical vessels with conical bases, of a total height of approximately 30 ft.; the diameter being from 6 ft. to 9 ft., according to the throughput of the installation. The bottom portion of the cone is provided with a valve which is so designed that, while being liquor-tight when closed, it permits of rapid and controllable discharge of the drained coal. The cone is also equipped with boxes containing grids through which the liquor is drained off. Owing to the previous removal of the dust from the coal, draining takes place at a very rapid rate, and the bulk of the liquor is drained off at its original strength, and passed by way of a float control tank to the strong liquor stock tank. While strong liquor is being withdrawn at the bottom of the drainer, fresh water is sprayed on at the top of the drainer in such a manner as to avoid dilution of the liquor. As the strong liquor level falls in the drainer, the superimposed water washes the particles of coal free from calcium chloride solution, and in its passage down the drainer forms a comparatively shallow layer of weak liquor, the specific gravity of which varies from (say) 1·4 at the bottom of the layer to 1·0 at its top. Sufficient water is added in this way to wash the coal or refuse entirely free from chloride, and allow a slight excess of chloride-free water. Immediately the diluted portion of the liquor reaches the float control tank, one float sinks, operating an electric signal, whereupon the operator diverts the outgoing solution into a weak liquor main, and thence into the weak liquor stock tank. The specific gravity of the solution falls very sharply; and at a predetermined point, a second float in the control tank sinks, operating another signal, when the remaining liquid, which contains a small and negligible quantity of calcium chloride, is passed down the waste pipe. The equivalent of strong liquor lost in this way amounts to less than half-a-gallon per ton of raw coal. The amount of fresh water required in washing varies somewhat with the nature and size of coal treated, but it may be taken as being of the order of 120 gallons per ton of raw coal. If desired, most of this water can be collected and re-used.

Owing to the close "cut" obtained in the air separator, and the complete removal of dust from the coal, the washing and draining process is rapidly effected, and occupies only about $1\frac{1}{2}$ hours for each drainer. At the end of this period, when the washing water has ceased running, the drainer is discharged, either into wagons or upon a conveyor, by opening the bottom valve a few inches. The free moisture content of the coal is so quickly reduced to below 5 p.ct. that even small coal, passing (say) a $\frac{1}{4}$-in. or $\frac{3}{16}$-in. screen, runs easily out of the drainer. Where trimming of wagons permits it, a drainer can be discharged in ten minutes.

CONCENTRATION OF WEAK LIQUOR.

Weak liquor is formed at a rate of about 70 gallons per ton of raw coal; its average specific gravity being approximately 1·2. This liquor is passed through a simple tubular steam-heated evaporator to raise its specific gravity to 1·4, and the concentrated solution is returned to the strong liquor tanks

for further use. By a special treatment the liquor is rendered entirely non-corrosive to iron and steel, and the semi-commercial plant in which it has been used for three years has remained entirely free from corrosion troubles.

At the Yniscedwyn plant, steam is raised with washery refuse containing on an average about 60 p.ct. of ash. Though the author entertains strong views on the advantages of employing coal with a minimum ash content for most purposes, the utilization of fuel of the lowest grade is justifiable, provided the transport and handling charges are also kept below the economic limit; and this can only be done at the colliery.

Cleaning Results.

The results obtained from the treatment of a number of coals tested in the semi-commercial plant in quantities of 10 to 20 tons are recorded in Table I. In explanation it should be stated that these coals were treated without the opportunity of ascertaining the best conditions in each case; and it is therefore to be expected that, with a little experience of the behaviour of each individual sample in the air and gravity separation, the results would be better.

The "fines" have a screen analysis which permits their direct employment for dust firing. The "fines" obtained commercially from anthracite duff in the Yniscedwyn plant are now satisfactorily burned in several installations without any adjustment of the existing powdered fuel burners. It is therefore tolerably certain that those produced from bituminous coal could also be burned without any difficulty.

This indicates the possibility of an enormous expansion of coal dust firing. I estimate that the natural coal dust available in Great Britain is of the order of 10 to 20 million tons per annum, which by the simple expedient of air separation can be put on the market, ready for the burner without further grinding. The provision of grinding mills can therefore be dispensed with, and the most costly and troublesome portion of present-day coal dust firing equipment becomes obsolete. Incidentally the controversy between the adherents of the central and the unit system of grinding will be settled by the disappearance of both.

The production of a "medium coarse" product calls for some comment. The yield of this fraction need not exceed 5 p.ct. of the raw coal in the case of smalls, and will be less in the case of the larger sizes. The figures shown in brackets in Table I. represent yields from one air separator only, as a secondary separator is not provided in the semi-commercial plant. This fraction is not a middlings product in the ordinary sense—*i.e.*, one of a medium high ash content—but it represents a mixture of sizes which must be withdrawn in order to comply with the specification of screen sizes in the "fines" and "coarse" portion. It is dealt with by returning it to the raw coal feed, when it will yield further quantities of "fines" and "coarse." In some cases it may be preferable to grind it, and add it to the "fines."

The ratio of products to each other depends, of course, on the nature of each coal, and varies from case to case. It can be varied within certain limits by the adjustment of the process. The efficiency of the gravity separation of the "coarse" raw coal coincides closely with the optimum point shown by the washability curve of each coal.

With most coals the nut sizes have an ash percentage above that of the inherent ash, inasmuch as they occlude a certain amount of free dirt within their mass. In order to obtain the cleanest product, the larger sizes would have to be crushed, for the detachment and separation of fusain and "free" dirt. The gravity separation being entirely independent of size, the process is equally applicable to large and small coal, and it suggests the possibility of dispensing altogether with hand-picking of coal.

The fear that coal treated in a bath of calcium chloride might not be readily freed of either chloride or moisture is dispelled by the actual working results. The chloride is removed so thoroughly that in most cases the actual chloride content of the clean coal is lower than that of the raw coal. The question of hygroscopicity of the coal from that source does therefore not arise.

The free moisture is reduced to a very small percentage in two hours or less, even with the smallest duff sizes, largely on account of the pre-treatment of the coal, which provides the conditions for ready drainage.

Coke made from coal cleaned by this process is of particularly

Table I.

	Durham Coking Coal.				Coking Coals.		Steam Coals.				Anthracite.	
	Trebles.	Doubles.	Singles.	Smalls.	Welsh.	Yorks.	Durham.	Durham.	Northumberland.	Welsh.	Duff.	
Screen Size	3½ in. to 1½ in.	1½ in. to 1 in.	1 in. to ½ in.	½ in. to 0 in.	½ in. to 0 in.	1 in. to 0 in.	½ in. to 0 in.	1 in. to 0 in.	1 in. to 0 in.	3 in. to 0 in.	⅛ in. to 0 in.	
Yields of products (air-dry basis)—												
Fines	..	..	..	13·4	7·1	5·2	3·9	1·6	4·5	8·1	12·5	p.ct.
Medium coarse	..	..	..	(10·2)*	..	(9·6)*	(10·1)*	(1·5)*	(7·4)*	..	(5·4)*	
Clean coal	74·5	65·2	75·7	61·6	77·2	71·8	72·2	81·4	65·5	59·0	58·7	,,
Refuse	25·5	34·8	24·3	14·8	15·7	13·4	13·8	15·5	22·6	32·9	23·4	,,
Total products	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	p.ct.
Ash in products—												
Fines	..	..	..	15·04	11·65	10·14	14·05	12·36	22·65	13·95	12·85	p.ct.
Medium coarse	..	..	..	15·23	..	18·38	15·09	9·22	26·90	..	11·10	,,
Clean coal	5·02	4·40	3·65	3·25	3·28	1·04	3·49	2·90	3·00	1·54	1·28	,,
Refuse	54·14	62·54	58·99	62·00	56·84	69·94	53·45	62·00	60·10	67·00	56·20	,,
Original sample	..	..	17·36	14·82	12·21	14·58	11·85	12·86	22·32	25·30	16·30	,,
Ash contributed to entire sample—												
Fines	..	..	..	2·0	0·8	0·5	0·6	0·2	1·1	1·0	1·6	p.ct.
Medium coarse	..	..	..	1·6	..	1·8	1·5	0·1	2·0	..	0·6	,,
Clean coal	3·7	2·9	2·8	2·0	2·5	0·8	2·5	2·4	1·9	0·9	0·8	,,
Refuse	13·8	21·8	14·3	9·2	8·8	9·4	7·5	9·7	13·6	22·1	13·1	,,
Total products	17·5	24·7	17·1	14·8	12·1	12·5	12·1	12·4	18·6	24·0	16·1	p.ct.
Original sample	..	..	17·36	14·82	12·21	14·6	11·8	12·9	22·3	25·30	16·30	,,
Calorific value—												
Fines	..	..	..	12,430	13,280	13,250	12,510	13,040	9,530	..	12,850	B.Th.U. per lb.
Medium coarse	..	..	..	12,230	..	..	..	..	..	..	13,560	,, ,,
Clean coal	14,310	..	14,480	14,680	14,860	14,630	14,250	14,280	12,950	..	14,900	,, ,,
Refuse	..	..	..	3,890	5,240	..	..	..	3,390	..	5,710	,, ,,
Original sample	..	..	..	12,580	12,850	..	12,420	..	10,310	..	12,020	,, ,,
Volatile matter (less moisture)—												
Fines	..	..	..	27·08	22·29	22·78	25·22	27·98	21·18	12·47	6·68	p.ct.
Medium coarse	..	..	..	29·26	..	29·93	29·57	31·89	30·08	..	6·12	,,
Clean coal	30·39	29·71	30·82	31·91	27·82	35·78	33·44	34·73	35·88	12·95	6·00	,,
Refuse	17·99	17·09	16·84	18·08	14·71	20·52	22·90	16·52	22·73	13·80	4·75	,,
Original sample	27·21	25·32	28·73	29·18	24·88	30·80	31·30	32·46	30·44	13·96	5·90	,,
Sulphur—												
Fines	..	..	..	1·39	0·84	0·77	1·81	1·43	1·96	..	1·08	p.ct.
Medium coarse	..	..	..	1·77	..	..	..	..	..	..	1·14	,,
Clean coal	0·42	..	1·04	1·08	0·73	0·90	1·49	0·73	0·97	..	0·70	,,
Refuse	..	..	..	1·83	0·48	..	..	..	1·23	..	2·49	,,
Original sample	..	..	..	1·20	0·75	..	2·29	..	..	..	1·18	,,
Chloride in terms of Cl—												
Fines	..	..	..	0·064	..	0·518	0·010	0·024	..	..		p.ct.
Clean coal	..	..	..	0·012	..	0·028	0·007	0·007	..	..		,,
Original sample	..	..	..	0·021	..	0·177	0·014	0·004	..	..		,,

* Not treated in secondary air separator.

high quality, and, as was to be expected, contains a very small percentage of breeze and ballast. In one case, a slack washed in an ordinary jig washer, and giving a yield of 12·5 p.ct. breeze and ballast, yielded under 3 p.ct. after treatment by the process described.

The advantage of a low ash percentage in coal to be carbonized in coke ovens, gas retorts, or low-temperature carbonizing plant requires no further emphasis. It can be safely asserted that the possibility of producing semi-coke from coals thus treated will give a considerable impetus to the development of low-temperature carbonization.

THE VALUE OF CLEAN COAL.

While the study of the mineral impurities in coal was sorely neglected until about ten years ago, their investigation is now receiving attention to an increasing extent. Their influence on the combustion and carbonization of coal is being examined, and the differences in the chemical composition of the inherent ash of the various coal components and that of extraneous mineral matter have been established for many varieties of coal.

Much has been written on the value of cleaned coal, by which hitherto was understood a coal from which the major portion of mineral matter had been removed, but which still contained a considerable quantity of ash-forming matter, over and above its "inherent" ash percentage.

We have now a means by which truly clean coal can be produced commercially at a cost comparing favourably with that of the less ambitious washing processes.

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Discussion.

The CHAIRMAN (Mr. Arthur Spyer) said it seemed that the Institute had two functions which appeared to be opposed. The first was to show how coal could be saved—which, from the coalowners' point of view might not be altogether pleasing—and the other was to show how the consumption of coal could be increased by substituting it for some other competitive fuel, such as oil. Therefore, if by improving the quality of coal by the methods described in the paper it could be made more competitive, a substantial advance would be made.

Prof. HENRY LOUIS, in the course of a written communication, observed that Dr. Lessing had resuscitated an ancient process—viz., the cleaning of coal by means of dense liquids. That had apparently been employed for a long time as a laboratory process, but appeared to have first been proposed by Sir Henry Bessemer, whose patent was dated 1858, just 70 years ago. This patent—No. 1724, July 30, 1858—claimed "the separation of coal from pyrites, shale, calcium carbonate, silica, &c., by means of a liquid of intermediate density, such as a solution of calcium chloride. . . . By using the liquid in two strengths, a very pure coal and an intermediate product may be obtained." Possibly, continued Prof. Louis, Bessemer's suggestion was tried out, but he had no records of the results obtained, and could only conclude from the fact that it was never seriously adopted that the results must have been unsatisfactory. The process was, however, fully tried out in Germany, and there was an interesting record in the standard text-book by Prof. F. Jungst. It was certain that a process based on treatment by a heavy solution could produce coal as clean as might be desired down to the limit set by the intrinsic ash, but it necessarily followed that the output of clean coal must be relatively reduced, and that a considerable proportion of good coaly matter must be retained by the refuse. These facts showed out clearly from Dr. Lessing's own figures. Future events would show whether Dr. Lessing's or Prof. Jungst's opinion as to the commercial value of the heavy solution process would prove to be the more correct.

Mr. A. WORSLEY said that long before the Institute of Fuel was formed a great deal of work had been done upon the separation of the substances of a compound nature; and it was regrettable that the results of this work had not been made public, because they would have saved a great deal of the work that had recently been done by members of the Institute of Fuel. In the use of small particles of coal, the question of size was not so important as the matter of shape. If one compared the fracture of bituminous coal with the fracture of anthracite coal, it would be found that bituminous coal broke up into elongated discs, whereas anthracite coal broke up more or less into rounded fragments. The flight of small discs in the air was very different from the flight of rounded fragments; and in work that had been done upon the separation of kainites from interstitial micas, this fact had been so completely proved that it was ultimately necessary to bring in a different method of separation before good results could be obtained. He did not know whether Dr. Lessing had discovered this fact. It appeared from Dr. Lessing's description of his plant that a dust very suitable for burning as pulverized fuel would be obtained; but they should not come to the conclusion that pulverized fuel would be produced in quantities in excess of the immediate demand of the particular colliery where the work was being carried out. There was the fact that the demand for certain grades of fine powdered coal was more or less fixed in the locality; and if there was a large demand for a particular grade of fine powdered coal, the price was very liable to rise. The position had to be avoided, therefore, of putting down plants capable of carbonizing larger quantities of low-grade coals than were available at the particular spot, because, if supplies had to be purchased from other districts, the cost would inevitably rise, and they might reach the position of such plants being compelled to use coal of an expensive character in order to keep them operating.

Dr. T. BARRATT observed the paper was remarkable in that it described work which had been designed and carried out by Dr. Lessing alone. He (the speaker) was particularly interested in the author's displacement method for removing the calcium chloride solution from the coal and the refuse, and its recovery, as this was similar to the process which had been used for many years in the recovery of the mixed acids employed in the nitration of gun cotton. How did Dr. Lessing manage to reduce the free moisture to a small percentage in such a comparatively short time of two hours? One would have thought—especially with such small coal—that this would prove a very troublesome process.

THE AUTHOR'S REPLY.

Dr. LESSING, replying to the discussion, said he was familiar with the Bessemer process referred to by Prof. Louis. It appeared that the process failed at the plant which was installed in Germany over fifty years ago, not from any inherent defect in the process, but because of the ignorance of the people concerned at the time, inasmuch as they had not a clear recognition of the constitution of coal, and they therefore endeavoured to treat a coal by the Bessemer process which, in the light of existing knowledge, it was absolutely impossible to treat successfully. This was a point which must be borne in mind as arising out of the research work that had been done on the constitution of coal in recent years. With regard to the dust question mentioned by Mr. Worsley, and the statement in the paper that the dust was not amenable to cleaning, the point was that the dust which was removed was the portion of commercial coal which contained the bulk of the fusain and very little of the finest portions of the clean coal. The mineral portion of fusain could not be removed by mechanical means. A certain portion could be extracted with acids, but mechanical means could not remove the ash, because it was largely due to the deposits from water which had percolated the coal seam, and was in the nature of boiler scale deposited through each particle in the pores of this highly porous material. Therefore, it was different from the other case of the clean coal portions, which simply adhered to the shale portions as they were deposited in the earth at the time when the plant residues were deposited. There was a sharp line of cleavage between clean coal and dirt, but there was no such cleavage between, and therefore no mechanical possibility of dividing, the middle portion and the carbonaceous portion. The latter was not coal substance, but was material greatly changed from its original chemical composition, for the volatile matter had largely been lost. This also disposed of the point made by Mr. Worsley as to the difference in the fines from anthracite and bituminous coal. The question of the demand for powdered fuel was an entirely different problem. Personally, he did not believe that the consumption of powdered fuel would be restricted to the collieries themselves, because the amount available in this country was between 10 and 20 million tons, and the powdered fuel would find a use at distances from the collieries, if only they could obtain transport facilities, either by pumping or by tank wagons. He was familiar with the displacement method, mentioned by Dr. Barratt, used in the explosives industry; and it was also employed in some other industry. There was, however, one qualification necessary when comparing work on coal with work on explosives—*i.e.*, the shape of the coal particle and the difference in sizes that were encountered. The reason why the moisture content was so low was the ease with which the comparatively viscous solution of calcium chloride could be drained out of the body of the coal.

The "Practical Engineer" Mechanical Pocket Book and Diary.—The 1929 edition of the "Practical Engineer" Mechanical Pocket Book and Diary has just been published by Messrs. Humphrey Milford, of the Oxford University Press, E.C. 4, at 2s. 6d. net. This is the forty-first edition of this useful compendium, and a considerable number of new notes have been introduced, and many of the previously existing notes have been altered and revised to keep abreast of the most recent developments. Special care has been bestowed on the index, with the object of rendering the available information relating to any particular subject readily accessible; and no pains have been spared to maintain, for the book as a whole, that high standard of practical utility and reliability which has come to be associated with it.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Discussion on Radiation from Gas Burners.

The Yorkshire Junior Gas Association, at a meeting held on Dec. 15, at the Department of Coal Gas and Fuel Industries, Leeds University, discussed a paper on "The Radiation from Gas Lighting Burners," delivered by Mr. H. J. Hodsman, M.B.E., M.Sc., F.I.C., Lecturer in Gas Chemistry at the University. The chair was occupied by Mr. S. H. PACKER, of Bradford, the President of the Association.

The PRESIDENT, introducing the lecturer, said that Mr. Hodsman really needed no introduction to Yorkshire Juniors. He was one of their esteemed members; and the Association were fortunate in having a paper by one so well-known in the gas industry, and so greatly respected for his research work, as well as for his work in the training of fuel students.

Mr. Hodsman then read his paper on "The Radiation from Gas Lighting Burners," which was published *in extenso* in last week's issue of the "JOURNAL."

Discussion.

The PRESIDENT remarked that the paper had suggested thoughts on radiation from gas burners which might well be new to many present. Anything which could be done in an endeavour to retain the lighting business for gas—which, undoubtedly, in the past ten or fifteen years, had been to some extent lost—was of very great value to the industry. It seemed to him that the information and figures given in Mr. Hodsman's paper provided the industry with a basis for a good deal of further thought on the subject. From the impetus given by the address, perhaps someone of an inventive turn of mind in the industry might produce a new form of burner by which the heating benefits from gas lighting could be more profitably exploited.

Mr. F. FIRTH (Leeds) said that Mr. Hodsman was to be congratulated on dealing with a subject which had not received sufficient attention. He (the speaker) was sure that the paper would be read with great interest by the gas industry in general. Certainly the Yorkshire Junior Gas Association was highly honoured by being selected as the medium through which the address could be passed on to the industry. One felt doubtful as to full competency to comment on such an intricate subject, but there was obviously a big field in which the results obtained by Mr. Hodsman might be utilized. One could well imagine, for instance, that a good cluster burner might be employed as a means of heating a bathroom. At a recent meeting of the Association, said Mr. Firth, there was some mention of the possibilities of the co-operation of gas lighting with electrical apparatus in respect of the benefits to be obtained from ultra-violet light. It was said on that occasion that, as far as gas was concerned, the ultra-violet light was more or less negligible, but that gas was rather rich in rays valuable in the treatment of rheumatic troubles. A point of interest in the address was in regard to the light emission being governed by the temperature of the solid. Mr. Firth spoke of an experiment which he carried out recently. He had put a mantle in a muffle furnace, and heated the muffle to 1500° C. He found the light emission was practically *nil*. As in the ordinary way the heat was localized in the mantle, probably the temperature was far above what one would expect.

Mr. J. W. HOLROYD (Elland) said that it was surprising to him to find that the radiation increased by adding refractory material to the top of the burner. In the matter of the total heat, including radiation and convection, given off from the burner, Prof. Leonard Hill had given some figures, but he (Mr. Holroyd) did not recollect that the Professor had ever particularized as to how that heat was divided.

Mr. HODSMAN, replying, agreed with the suggestion voiced by Mr. Firth in regard to heating bathrooms. He (Mr. Hodsman) had found the cluster burner a very effective heating medium. The point as to mantle efficiency opened a big question, and one which took up a whole lecture in his training scheme at the University. He recollected well that, when he was himself a student, the incandescent mantle was held up as a scientific marvel, and something for which there was no very clear explanation. When someone put a mantle into a furnace, they were surprised to find, as Mr. Firth had found, that it seemed no brighter than its surroundings. Mr. Hodsman here threw on the screen a slide of a graph illustrating a spectral energy curve for an incandescent mantle. From the curve, it was seen that, in the region of the heat rays, the mantle was radiating very little. The proportion of light to heat in an incandescent mantle, said Mr. Hodsman, was abnormally high. One result of the incandescent mantle as compared with carbon as a power radiator was that, when a mantle was put into a flame, it would more nearly approximate the temperature of the flame than would a mantle made from (say) a good radiator material, such as oxide of iron. A good radiator was like a leaky tank, while a poor radiator, like an incandescent mantle, was like a sound tank. In regard to Mr. Holroyd's question as to convection, Mr. Hodsman said that the heat which was conducted away from a burner could only be conducted by the supply pipe. This was only a small quantity, and the convected heat must be approximately the balance between the 100 p.ct. and the heat radiated.

Mr. W. H. BLUNDSTONE (Dewsbury) asked how Mr. Hodsman accounted for the fact that, with the lower consumption per hour, he got consistently higher results in the percentage of heat radiated. In regard to the matter of the invisible spectrum, there seemed an enormous proportion of the red in comparison with the violet end; and it would appear, in theory, incompatible that there should be any white heat.

Mr. H. HODGSON (Leeds) asked if Mr. Hodsman could define any limit of capacity in combinations of the various colour lines to form an ideal illuminant.

Mr. HODSMAN said that, while he could not on that occasion go into detail as to how it had been done, he might say that the sensitiveness of the human eye to light of different wave-lengths had been determined, and visibility curves had been drawn. The maximum was in the green light. As to the best combination, one would imagine something that most nearly approached sunlight would be the best; but even sunlight varied from one hour of the day to another. The human eye, of course, was very adaptable to varying light.

Mr. H. R. LAWTON (Bradford) asked the lecturer how he explained the big difference between the figures given for the inverted incandescent burners with silica globe and the figures of a spherical glass globe.

Mr. HODSMAN replied that he himself had been much struck by this difference. The experiments, however, had been made some six years ago, and there did not happen to be anyone available to go further into the investigation. He was still hoping to have the opportunity of investigating that difference. The thing which had impressed himself as much as anything, continued Mr. Hodsman, was the figure of 37 p.ct. without globe. This certainly suggested what a convenient and efficient method of heating could be provided if suitably designed gas burners were made with this end in view.

Mr. A. B. HORSFIELD (Leeds), remarking on the great efficiency shown in the case of the three-cluster burner with a 7-in. reflector above the burner, said he wondered whether the light in the heat would be in the same proportion without the reflector.

Mr. HODSMAN said that, in any experiments relating to heating from burners, it must be remembered that, after all, a lighting burner must be a good illuminant; and one could not afford to sacrifice illuminating power to get a better source of heat. To answer Mr. Horsfield's question fully would require some photometric measurements. He had no experiments actually to answer Mr. Horsfield's point, but he did not see any reason why the illuminating power should have been influenced by the reflector at all.

Mr. V. J. J. SIDDONS (Bramley), speaking of the silica reflector, remarked that if the latter had been proportionately larger, and of concave surface, perhaps there would have been a higher figure of heat.

Mr. HODSMAN agreed that alteration of the shape might make the figure more effective.

VOTES OF THANKS.

Mr. J. W. HORWILL (Junior Vice-President, of Bradford), proposing a vote of thanks to Mr. Hodsman for his paper, said that the address was one not only of great value to the members of the Yorkshire Junior Gas Association, but, through the columns of the "GAS JOURNAL," would afford an opportunity for other associations, and the gas industry generally, to learn something of the results of Mr. Hodsman's investigations on this very interesting subject. He was strongly of opinion that the gas industry should make more of the lighting load, despite the circumstances of rival illuminants to-day; and he thought that a great deal of good could be done with facts such as Mr. Hodsman had given. The heating value of the gas mantle was a valuable propaganda point.

Mr. C. H. CHESTER (Wakefield), seconding the motion, suggested that the industry had concentrated so much on the relative costs of gas lighting and of rival illuminants that they had tended to ignore the valuable factor of heating value. It seemed to him that the designers of gas burners had a new field for exploration in the development of their burners. Hitherto they had tended too much to develop only illuminating efficiency—a very important point, of course, but, as Mr. Hodsman had shown, not the sole factor to be advocated in gas lighting. If it were not for the problem of disposing of the products of combustion, he (Mr. Chester) would be tempted to explore how far the industry might be able to combine lighting and heating of rooms by gas by means of one apparatus.

Mr. HODSMAN, replying to the vote, said that what he had endeavoured to do in his paper was to point out the fundamental difference between gas and electric lighting in this particular direction of heating, and to give some figures which might be used in driving home the case for gas lighting. The difficulty of the products of combustion existed, as they all knew, but it was not in all circumstances so serious a matter as was sometimes felt. There was a great deal of workshop lighting, for instance, in which the products of combustion were no serious disadvantage, if any at all. In the workshop at the Fuel Department of the Leeds University, for example, he had had a large gas burner installed as an extra heating agent, simply because of the difficulty of keeping the place warm. The men there had been very appreciative of it. On occasions when the steam heating had failed, the gas burner had been the sole heating of the workshop, and had proved very efficient.

On the proposition of Mr. F. FIRTH (Leeds), seconded by Mr. S. T. S. MUSGROVE (Sheffield), a hearty vote of thanks

was awarded the University Authorities for the use of the room, and their unfailing kindness to the Association, and to Prof. J. W. Cobb, Head of the Fuel Department, for the use of his room for a meeting of the Council prior to the general members' meeting.

Mr. J. W. WOOD, of the Fuel Department, in responding, said the Department were always glad to be of service to the gas industry. Mr. Hodsman and himself were ordinary members of the Yorkshire Junior Association, and proud to be such members; and as such they were glad to do their part in furthering the interest of the Association's proceedings. One had heard a good deal about famous German scientists who had done wonderful work in regard to flame; but he might remind the meeting that Mr. Hodsman was one of those "German" scientists who had accomplished much valuable research work at Karlsruhe, as well as at Leeds.

SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).

A Meeting of the Association was held in the Royal Technical College, Glasgow, on Dec. 1, under the presidency of Mr. JOHN MURRAY.

STREET LIGHTING AND EQUIPMENT.

By THOMAS M. LAPPIN, of Glasgow.

There are 670,000 public lamps used for street lighting in Great Britain and Ireland; 585,600, or about 87 p.ct. of the total, being lit by gas. In Glasgow about 23,000 gas lamps are used for street lighting.

"B.E.S.A." SPECIFICATION FOR STREET LIGHTING.

In the advancement of the science of street lighting, perhaps no more definite step has been taken than the production of the British Engineering Standards Association Specification for Street Lighting, No. 307, 1927. The specification sets out higher standards for street lighting than are customary, and indicates that the present illumination provided is inadequate.

The amount of illumination falling upon a roadway at any point is only one of the criteria by which street lighting may be judged. Its value lies not so much as a guide to the visibility in a street where illuminations are of a low order, as for comparing installations. In the specification, street lighting installations are divided into eight classes, lettered A to H, having a mean test-point (or approximately a minimum illumination) at ground-level of from 2 foot-candles for Class A, decreasing in each class to 0·01 foot-candle for class H. Minimum mounting heights are also specified; the lowest being 13 ft. It is further laid down that the spacing-height ratio should not exceed 12.

THE SPECIFICATION AND PRESENT PRACTICE.

Common street lighting practice is to have gas burners in square lanterns giving a mean lower hemispherical candle-power of 150 to 200, mounted about 10 ft. 6 in. high, and spaced about 50 yards apart, which gives a spacing-height ratio of 14·3. Such an installation would give approximately a minimum illumination of 0·01 foot-candle, which is only within the lowest class specified—namely, H. Further, in a large number of cases spacing of the lamps at 70 and even 80 yards is to be found, with consequent lower minimum illumination. Smaller candle-powers with closer spacing are prevalent, but such installations are also within class H. This, it should be noted, is common practice, and proves the inadequacy, for class H is not recommended for streets which are appreciably used for through traffic.

GLARE.

Glare being accepted as a quality which affects the ability of the eye to perceive detail, or which causes discomfort, a method has been adopted in the specification by which an approximate value may be found for glare in any installation. Diagrams have been prepared for angles approaching the horizontal which represent values for glare. On these diagrams, points, obtained from a consideration of the polar curve of the distribution of light from the source and its mounting height, are plotted, and a coefficient for glare at any angle is obtained. When the glare figure, G, is greater than 10, it is considered detrimental to visibility. Small units, low mounted, may have a glare figure in excess of this, particularly in installations where modern burners of high efficiency, and greater candle-powers and gas consumptions, have been adapted to existing equipment at relatively low heights. G in the installation assumed may have a maximum value of 12 or 13. The classification of street lighting installations according to illumination values and the valuation of glare should be studied by the gas industry.

VISIBILITY IN A STREET.

The visibility of objects in a street at night is mostly by contrast of the object against a background. In most cases the roadway itself forms the background; and therefore the nature of its surface is of great importance. A light-coloured roadway, having a relatively high reflecting power, gives a greater brightness (and consequently a background against which objects stand out in relief by contrast) than one having a dark surface. Also, since the effect of glare from a source is reduced by diminishing the contrast between the source and its background, the visibility in the street having the lighter coloured surface and greater brightness is further assisted by the reduced glare. Buildings bounding a roadway also assist in making objects visible by forming in some measure a background. To legislate for the nature of the road surface in planning an installation is rather a difficult matter, as not only do different road surfaces vary in their reflection values, but any one road surface varies from time to time, according to whether it is wet or dry.

If two similar installations materially differ only in the reflection factors of the road surfaces, then, to increase the brightness of the dark surface to that of the surface with the higher reflection factor, it is necessary to increase the illumination on that surface. This may be done by increasing the candle-power of the sources, when the value of G would increase, with detriment to visibility. Alternatively, the distance between light sources could be reduced, in which case the numerical values of G would remain unaltered, but he found at different positions in the roadway. The brightness of the background will have increased, resulting in better visibility; but, on the other hand, since the number of sources—and hence the number of contrasts against dark backgrounds—have also increased, on looking along the street these additional contrasts seem to render the ability to see through the installation more difficult. The remaining alternative for increasing the brightness of the surface is to instal greater candle-powers at increased mounting heights.

EFFECT OF HIGH AND LOW MOUNTED UNITS ON VISIBILITY.

Small units, low mounted, being more directly and continuously in the line of vision, give greater interference with visibility than do high mounted units. The confusion created by the large number of contrasts with low mounted units is increased by the shadows cast by the frames and bottoms of the lanterns themselves. With low mounted units, even though they be spaced comparatively closely, long narrow bands of reflected light may be seen with relatively dark areas alongside. A pedestrian crossing such a roadway may be visible in one of these bright bands, but may disappear on passing into a dark area. If the surface is wet, glare is also experienced from these bright patches. In general, it may be said that, with low mounted units, a high diversity factor (*i.e.*, ratio of maximum to minimum illumination) is found, and the appearance, looking along the roadway, is patchy. High mounted units permit of the use of greater candle-powers, and there is less glare. They reduce excessive contrast and give increased illumination on the roadway. The diversity factor is lower than with low mounted units, and there is less shadow behind each source. No diversity factor is given for installations in the specification, but it states that "the illumination on the ground shall be so graded as to avoid an abrupt change at any point."

LOW MOUNTED UNITS.

Though the mounting of light sources at greater heights is the trend in modern street lighting developments, the square lantern at a height of about 10 ft. above ground-level is still most prevalent. It is cheap, simple, and in some measure efficient. Two obvious but often neglected requirements of a square lantern are that the glass panes should be cleaned regularly and that the lantern should be large enough to accommodate the burner in use. A test made recently showed the depreciation in candle-power from a burner, due to dirt on the glass panes of the lantern, to vary from 5 to 10 p.ct. for the first week in use.

In Glasgow, where square lanterns are employed, the average distance apart of the lamps is 25 yards, measured along the centre-line of the roadway. The mounting height is about 10 ft. 6 in. to the point of light. Burners are in use ranging in gas consumption from 1·25 to 6·75 c.ft. per hour, all consumptions being rated at a pressure of 26 tenths water gauge. All burners are tested for consumption before being installed; fixed nipples and governors are employed.

Since any light source for street lighting requires to be constant, and obtained at minimum cost, standardization of appliances is necessary. If the calorific value and the pressure of the gas are constant, the adoption of burners suitable for the particular conditions seems reasonable. This has been aimed at in Glasgow. All burners have nozzles suitable for standard mantles, which have two special lug rings for suspension from the nozzle. Mantles are tested for candle-power and strength. The dimensions are also standardized according to the gas consumption of the burner with which the mantle is to be used.

A burner which is being extensively employed for the lighting

of thoroughfares carrying through traffic, and for the more important residential thoroughfares, is a 4-light cluster having a gas consumption of 6·75 c.ft. per hour. This burner was first used as an alternative to high mounted units as a rapid means of providing greater illumination on roadways carrying increased traffic.

The burner as first installed was of the general conversion type of swan neck; later, however, the burner was developed into a horizontal one fitted in the roof of the same type of lantern above the reflector. This horizontal burner, which is now coming more generally into use, has much to commend it over the ordinary type of conversion burner. Higher candle-power efficiency is obtained. The lantern has a more pleasing appearance; there being less obstruction in the centre of it. For this reason it is more easily, if not more quickly, cleaned. The mantle consumption per nozzle per annum is less than with the ordinary type, and corrosion of the burner is not so great.

Streets in which this type of burner is employed give a minimum illumination of 0·025 foot-candle, and a diversity factor of about 7. The visibility of objects in a street of average width is good; pedestrians at all points across the roadway being seen at a distance of 150 to 200 yards away. The diversity factor is low in comparison with some installations of low mounted units.

A 2-light burner of rated consumption 3·5 c.ft. per hour is also used in both forms. The swan-neck type, however, is gradually being displaced in favour of the horizontal pattern. Only residential districts are illuminated with the unit. The diversity factor is similar to that obtained with the 4-light type. Objects can be seen at most points of the roadway at distances up to 100 yards. The value of a road surface having a high reflection factor is more pronounced with this unit.

HIGH MOUNTED UNITS.

High mounted units have already been referred to in regard to glare and visibility. In such installations the control of the lamps is taken entirely out of the hands of the lamplighter, for, for purposes of maintenance, an extension ladder or some form of tower is necessary. High mounted gas units do not appear to have been adopted on a large scale generally. In Glasgow such an installation has been in operation for a considerable period. The lamps are of the 10-light size, using No. 2 mantles, and have a rated consumption of 25 c.ft. per hour. The spacing of the lamps is 35 to 40 yards measured along the centre-line of the roadway, and the height to the source from the ground is about 22 ft. As originally installed, these lanterns were automatically controlled from the base of the pillar. The two main difficulties experienced were failure of the by-pass to remain alight, and bursting of mantles. The latter seemed to take place at lighting and extinguishing times, and was due principally to the flames firing-back to the gas nipple. The mantles also in some cases became dull and sooted, despite careful regulation of the gas and air mixture. The mantle consumption per lamp was consequently heavy. Extinction of the by-pass was a serious fault.

Automatic control of high mounted gas units (apart from clockwork or pressure-wave systems) is one direction in which their value for street lighting may be enhanced. In an endeavour to reduce the mantle consumption and maintain the full candle-power efficiency of the lamps, pressure governors were fitted on the rising pipes in the bases of the pillars, but this practice had to be discontinued after a short time; the governor being put out of action by water of condensation. This may have been due to the large volume of gas being carried to the lamps.

Latterly the automatic control of the lamps was dispensed with; a simpler and more effective method being devised. The lever cock of the lantern was weighted at one end, and from this end a flexible steel wire was led over two pulleys and down the side of the lamp column, through guides. Since this change-over the behaviour of the lamp has been satisfactory. The number of failures of the lamps to light up is now normal for any system in which by-passes are used. Maintenance costs in this respect and in regard to mantle consumption have been greatly reduced. The mantle consumption last year was just over 3 mantles per nozzle. The visibility of objects in the street is such that objects can be seen at distances of over 200 yards. There is no serious discomfort due to glare, and shadows are soft. An average minimum illumination of about 0·07 foot-candle is obtained, and the installation falls somewhere between classes E and F of the specification.

Another installation of relatively high mounted gas lamps is one in which the lanterns used have four No. 2 mantles; the rated consumption is 10 c.ft. per hour. The lamps are spaced about 30 to 40 yards apart, and the mounting height to the point of light is 14 ft. Viewed along the street, the roadway appears rather patchy. The mantle consumption for these lamps is greater than that of the 10-light size, being about 6 per nozzle per annum per lamp. No protection is afforded the mantles during cleaning; and if this is done in bad weather, immediately the globe is opened the mantles are liable to be damaged. The by-pass tubes have to be cleared regularly to avoid obstruction. With this type of lantern, and also with the larger 10-light pattern, the average globe renewals amount to about one globe per lamp every two years. This may appear to be rather destructive criticism, but it is made so that it may be helpful in the production of gas lamps suitable for mounting at heights giving advantageous distribution of the light on the roadway, for progress in street lighting with gas lamps may be made with more high mounted units.

CORROSION OF EQUIPMENT.

With the great improvements which have taken place in gas burners generally, greater heat is brought to bear on all equipment. The quality of gas has also altered, and the effect of both of these changes on equipment renders necessary the adoption of materials which will resist corrosion. Not only does the corrosion destroy the fittings, but it involves more frequent maintenance of the lamps. Unless this is done, the aim of obtaining maximum lighting efficiency is defeated.

A short discussion then ensued, the following members taking part: Messrs. R. Keillor (Greenock), R. Fife (Kilmarnock), Fean (Helensburgh), S. McGowan (Glasgow), A. McFarlane (Glasgow), N. Paton (Glasgow), and W. Campbell (Falkirk).

A "KODAK" AT THE WORKS.

By S. WEBSTER, of Port Glasgow.

The photographic world owes a great deal to the gas and allied industries, for it is from tar derivatives that many of the chemicals employed are manufactured. During the past ten to fifteen years, there has been a marked advance in the use of photography for the benefit of mankind. X-ray photography is now used fairly extensively for the examination of such things as castings, in order to detect flaws. Is it not feasible that an adaptation of this method could be employed to examine retort materials before use and also during their working life, in order to locate faults, &c., with a view to rejection or repair? For those interested in the making of perfect sulphate of ammonia, a possible means of examining the salt for good crystal formation would be photo-micrography. Aerial photography is used only to a limited extent in this country, though this method of charting distribution systems has its undoubted advantages, and has been largely practised in America, where, as described by an article in the Technical Press, one gas company bought an aeroplane with camera complete for such work. It is within the bounds of possibility that in the near future, instead of examining a chart or graph of retort temperatures, we shall study a set of colour prints of the heats themselves. Lately I have been experimenting with the possibilities of ordinary photographic film in recording the temperature of a retort; the basis being the density of silver deposit on a negative. Technical difficulties, however, seem to bar the way at present. The perfecting of photographic materials should eliminate the difficulties; and if colour photography is as successful as anticipated, there seems no reason why we should not have this undoubted aid to efficiency.

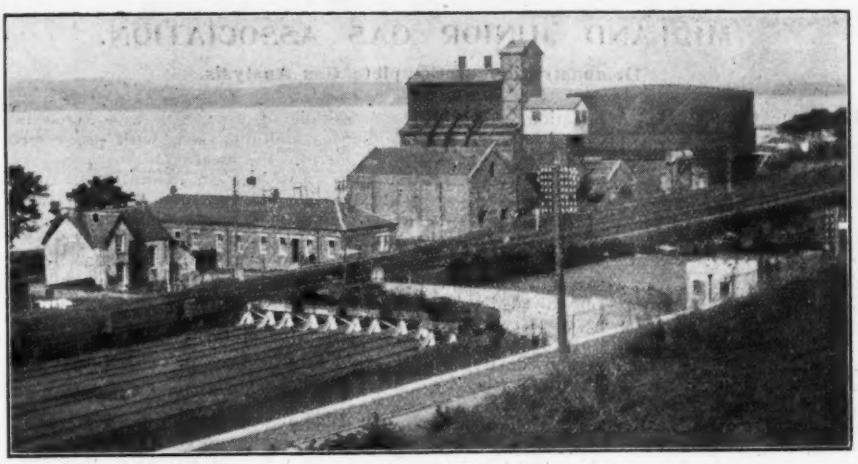
The judicious use of the camera would build up a permanent record of the growth of a works. This could include any extraordinary repairs or expedients used in times of stress. A record of the building of a complete new works, or the reconstruction or installation of plant, could be made without difficulty. The records so secured would be very suitable for illustrating articles in the Technical Press. The range of subjects is practically limitless; anything from an ordinary view to a photo-micrograph can be tackled.

The mention of "Kodak" in the title of this paper does not infer that this is the only type of camera suitable. Any camera may be used—anything from the box form to a full-plate field model. Each type has its advantages and limitations, which must be taken into account. The best compromise would, I think, be the folding focussing type so popular to-day. I personally use a 3¼ in. by 2½ in. negative size. A tripod is an undoubted advantage.

Ample exposure is the foundation of successful photography in any sphere, and requires careful attention. Experience is the best guide in the matter, while the use of an exposure meter is of advantage in the open. When in doubt about exposure always err on the over rather than the under side.

The development of the negative for the making of lantern slides or enlargements is carried out as usual, and, to anyone who has made "gaslight" prints, the making of lantern slides by contact will present no difficulties. The work of making slides can be carried out by any photographic dealer at comparatively small expense. Owing to the large degree of enlargement through the lantern, the negatives intended for the production of lantern slides must be very accurately focussed; and, for this reason, it is desirable when using a film camera on a near object to measure the distance of the object from the lens of the camera, setting the focussing scale to that distance. This operation is specially necessary if a portrait attachment is used, in order to give a larger image. This sharpness of focus also applies to negatives intended for enlargements for the Technical Press, owing to the necessity for a sharp positive in the production of printing blocks.

The taking of records of work will be of extreme interest in later years. Many of the older men in the industry would give



GENERAL VIEW OF THE PORT GLASGOW GAS-WORKS.

[Reproduced from a photograph taken in bright sunlight (exposure time, $\frac{1}{25}$ sec.) by Mr. S. Webster.]

much to have the scenes of their early work, and a picture story of their advancement, preserved in an album of prints.

The records so secured would be a great help in the illustration of papers to Associations, Men's Guilds, and Clubs. I am sure that Technical Colleges would welcome a set of prints depicting (say) the building of a gasholder from start to finish.

Mr. R. COWIE (Hawick) expressed his pleasure at being at a meeting of the Association after some twenty years. He said that he had listened with very great interest to Mr. Webster, who was an expert in his subject, and at one time was his (the speaker's) assistant at Port Glasgow. Mr. Cowie spoke of the advantages of photography in the gas industry, and suggested that electrolysis of mains could be photographed with advantage. He had a complete photographic record of the construction of the works at Port Glasgow, which was contained in two volumes and proved useful and interesting.

Mr. J. ROBSON (Plean) said that photographic evidence was invaluable in the case of accidents.

Mr. R. KEILLOR (Greenock) congratulated Mr. Webster on an original paper which opened a possible source of interesting meetings for the Association. With regard to the possibility of photographic records of temperature, though he realized the difficulties, he thought that there might be development in the future.

Mr. WEBSTER thanked the members for their appreciation of his paper.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

On the afternoon of Saturday, Dec. 8, the Eastern District of the Scottish Junior Gas Association held a meeting and visited the Durie Foundry of Messrs. Henry Balfour & Co., Ltd., and the Corporation Gas-Works at Leven, Fife.

Meeting in the early afternoon at the Durie Foundry, the members were received by Mr. Alex. Wilson and Col. Balfour Graham, Directors, and also members of the staff of Henry Balfour & Co.

Col. BALFOUR GRAHAM extended a hearty welcome to the visitors, and referred to his fellow-Director's (Mr. Wilson's) early connection with the Junior Gas Association in Scotland.

THE DURIE FOUNDRY.

The party thereafter proceeded in groups over the works, each group being conducted by a member of the staff. In order that the visitors should derive the greatest advantage from the visit, the firm had arranged for a number of their workers to be in attendance throughout the many departments; and consequently the entire process of manufacture of apparatus for gas-works and colliery plant could be inspected.

The works are equipped with the most up-to-date machinery for labour saving, rapid and careful handling, &c.; and the visitors were impressed with the thoroughness and accuracy of the firm's present practice.

From the general offices the visitors first passed into the moulding shop, which is well equipped with pneumatic rammers, sand riddles, and a pneumatic "Osborne" plate-moulding machine. Of special interest to the visitors was the core-making machine for cores up to 1 in. square (for purifier plates), equipped with a gas-fired oven for drying.

The boiler and gasholder shop consists of one main bay served by two electric overhead cranes of 15 tons capacity. The equipment of the heavy department comprises a heavy set of horizontal bending rolls, Asquith high-speed girder drills, a Kitchen and Wade direct-driven high-speed radial girder drill, a hydraulic riveter with a varied rivet pressure from 40 to 80 tons, an electric welding machine for eight welders, and pneumatic caulking and riveting hammers, drills, and other machines.

The gasholder department is well equipped with multiple punches, guillotine shears, levelling rolls, and high-speed sensitive drills for circle work. The angle bending machine is set adjacent to the plate furnace.

The pattern store contains innumerable patterns for all types of gas-works plant.

THE LEVEN GAS-WORKS.

The tour of Durie Foundry completed, the visitors then proceeded to the Leven Gas-Works, where they were met by Ex-Provost Mackay, Chairman of the Corporation Gas Commissioners, and Mr. H. A. Aitken, the Engineer and Manager.

The carbonizing plant consists of a Glover-West vertical retort installation erected in 1926, and built upon a ferro-concrete raft foundation supported by precast piles. The bench is capable of producing 9 million c.ft. of gas per day, and consists of twelve retorts. A natural-draught waste-heat boiler of the West-Galloway vertical water-tube type is installed, and is capable of evaporating 1000 lbs. of water per hour from and at 212° Fahr. It is fitted with coil superheating, automatic water feed, high and low water alarm, and feed pumps in duplicate.

The sulphate of ammonia plant was installed in 1908; a new Taylor saturator being introduced in 1927. Annular condensers, tower scrubber, Livesey washer, and brush scrubber by Messrs. Henry Balfour & Co., Ltd., of Leven, comprise the auxiliary gas plant. As these portions are now too small for effective working, extensions are meantime in contemplation. Exhausters in duplicate, supplied by Messrs. G. Waller & Son, of Stroud, each direct coupled to steam engines, and capable of passing 25,000 c.ft. of gas per hour, comprise the exhauster plant. The purifier plant consists of four boxes installed by Messrs. Henry Balfour & Co., Ltd.

Having travelled over the entire plant, the visitors were entertained at tea on the joint invitation of the Leven Gas Commissioners and Messrs. Henry Balfour & Co., Ltd.

Mr. J. SCOBIE (Dunfermline, Vice-President) expressed the Association's regret to learn of the indisposition of the President, Mr. Gavin, and wished him a speedy recovery to his usual good health. He expressed, to both firms who had that day entertained them, the grateful thanks of those present for the welcome which had been extended, and for the hospitality shown. All had spent a most enjoyable and informative afternoon; and the privilege of seeing in process of manufacture gas-works apparatus as produced by Messrs. Henry Balfour & Co., Ltd., demonstrated the efficiency of this old-established Scottish firm.

Ex-Provost MACKAY replied on behalf of the Gas Commissioners.

Col. BALFOUR GRAHAM and Mr. WILSON subsequently spoke of the pleasure it was to the firm they represented to have a visit of the Juniors to the Durie Foundry.

Mr. JOHN RICHMOND (Penicuik) also expressed his appreciation of the visit; and a vote of thanks to the Chairman brought the proceedings to a close.

MIDLAND JUNIOR GAS ASSOCIATION.

Demonstration of Complete Gas Analysis.

A Meeting of the Midland Junior Gas Association was held in the Council House, Birmingham, on Thursday, Dec. 13—Mr. F. CAUDWELL (Shrewsbury) presiding over a large attendance.

DEMONSTRATION OF COMPLETE GAS ANALYSIS.

By A. R. MYHILL, A.I.C., and E. T. PICKERING, B.Sc., A.I.C.

The major portion of the evening was devoted to a demonstration of the working of the apparatus employed by the Birmingham Gas Department for the purpose of carrying out the "complete" technical analysis of gases of various qualities. The apparatus and method are those originally devised by Bone and Wheeler in 1908, with certain modifications whereby the original method of estimating the H_2, CH_4, and N_2 by explosion has been discarded; the gas, after removal of absorbable constituents, being completely burnt over copper oxide in a silica tube at a temperature of 800° to 900° C. The effect of dead space in the combustion tube is eliminated by evacuating the latter before and after the combustion. The amount of hydrogen is measured by the contraction on combustion, and the methane by the volume of CO_2 thereby produced.

No originality of method or apparatus was claimed; the demonstration being regarded as of an educational character, in which the basic principles of gas analysis were outlined, and their application to the particular apparatus discussed.

A description of the original Bone and Wheeler gas analysis apparatus may be found in the "Journal of the Society of Chemical Industry," January, 1908; an abstract appearing in the "JOURNAL," Vol. 101, p. 160. Details of the modifications introduced for use in the Birmingham laboratories are described in an article by Dr. E. W. Smith in the "Gas World," November, 1919, as well as a description of the modified Orsat apparatus—a specimen of which was also on exhibition during the meeting.

The main points which the authors regard as important advantages possessed by the particular form of apparatus described over certain other types are as follows: The apparatus is of the constant volume type, so that comparatively small volumes of gas can be used for the analysis. For instance, 10 c.c. of gas may be expanded to have a pressure of 100 to 200 mm., which is sufficient to give quite reasonably accurate results in analysis. The measurements are unaffected by barometric pressure or tension of aqueous vapour, and the influence of solubility of constituents other than the particular one under estimation is reduced to a minimum by the employment of the smallest possible amounts of reagent for absorption. This source of error is also reduced by the employment of mercury as confining liquid. The apparatus is reasonably accurate and rapid in use; a determination of CO_2, HC, O_2, CO, H_2, CH_4, and N_2 being possible in about 40 minutes.

The above points apply to both the original Bone and Wheeler apparatus and the modified form demonstrated. In addition, it is claimed that the combustion of the residue after the absorption of constituents up to CO in one stage over CuO has certain advantages over the original explosion method, in so far as any errors due to a too rich or a too poor air-gas mixture for explosion are eliminated. Moreover, in employing the explosion method, the volume actually taken for the explosion is usually a fraction only of the residue, so that any errors are multiplied by this factor. The copper oxide combustion method also has the advantage of determining the nitrogen directly, instead of by difference.

Methods for the determination of hydrogen, methane, and nitrogen by the Jaeger fractional combustion process, by explosion, and by the use of palladium, were described in outline, and their advantages and disadvantages pointed out. It was remarked that combustion of hydrogen over palladium, or fractionally at relatively low temperature, sometimes led to uncertain results unless troublesome precautions were taken to ensure the maintenance of correct temperature conditions, while the explosion method was not always satisfactory with gases of unknown approximate composition.

Emphasis was laid on the necessity of observing certain precautions in the use of the apparatus, the main points being:

(1) Correct composition and quantities of absorbing reagents and duration of absorptions, in order to ensure complete removal of the required constituents and to eliminate errors due to solution, vapour pressure, and secondary reactions.
(2) Correction for gas temperature and variations in the "vacuum reading."
(3) Correction for oxygen evolved from copper oxide under the conditions of analysis.

It was shown that the apparatus may be used for making up an average sample of a number of individual samples, where the average composition only is required; and suggestions were made regarding the cleaning and maintenance of the apparatus.

A sample of town gas was taken in the presence of the audience, and analyzed, with progressive descriptions during the course of the meeting.

There was also on exhibition a modified Orsat apparatus fitted with CuO combustion tube as used by the Birmingham Gas Department for the rapid determination of CO_2, HC, O_2, CO, and N_2 for control purposes, &c.

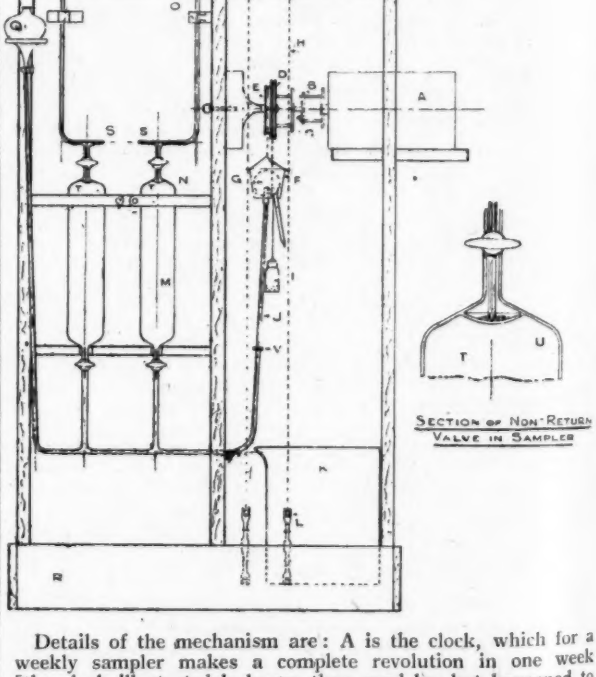
In addition, a device which has been employed successfully for the collection of continuous samples of gas passing along a main over a long period varying from a day to a week was exhibited and described. This apparatus, which is detailed fully below, comprises a mercury sampling vessel; the gas being aspirated from the test service by clockwork mechanism.

A MECHANICAL GAS SAMPLER.

In Birmingham, samples of gas are collected off various main streams into 10 c.ft. holders over a period of four hours, for calorific value test purposes. It has been the practice (for the purpose of gas analysis) to take from each test holder a small sample in mercury-filled samplers; a measured amount of mercury being run off at the end of each four-hourly period, so that the sampler is just completely filled with gas in a week. Care is, of course, taken to obtain a representative sample by taking it off a live stream. The samplers are manipulated by shift chemists, and some difficulty has at times been experienced in getting a true sample free from small quantities of air introduced accidentally during collection.

The mechanical sampler to be described has been devised in an attempt to overcome this difficulty. The special sample bulbs M (supported in the wooden stand) are filled with mercury and connected to the gas supplies at S, S; excess gas being continuously passed to the jets P, P. At their lower ends, the bulbs are connected by the thick wall rubber tube J to the overflow vessel G; the latter being continuously lowered by the clockwork mechanism immediately above. This causes mercury slowly to overflow from the sample bulbs; gas thereby being pulled into samplers from supplies at S, S.

A small mercury seal is incorporated in the samplers at N, to prevent any tendency of the gases to diffuse. The construction of this seal will be best understood by reference to the diagram. The gas, after bubbling through the mercury, enters the main body of the sampler through the small orifice U. (The construction of this seal calls for skilful glassblowing, but, when properly made, is robust).



SECTION OF NON-RETURN VALVE IN SAMPLER

Details of the mechanism are: A is the clock, which for a weekly sampler makes a complete revolution in one week [the clock illustrated is larger than need be, but happened to be available]; and this is connected through the double-pronged coupler B and ratchet wheel C to the pulley D, which revolves on ball bearings. Locked to the latter is a wooden pulley wheel E, the diameter of which is equal to the length of the sample bulbs (from shoulder to shoulder). The overflow vessel (carried in the light cradle F) is attached to the wooden pulley E by a fine chain, the end of which is fixed to a point on the circumference of the wheel; and consequently in

one revolution of the clock the overflow falls through the effective length of the sample bulbs.

In order to keep the strain on the clock as small as possible, the pull of the overflow vessel and rubber connecting tube is nearly balanced out by the weighted bottle I which is attached to the pulley D by a fine chain, but passes over the pulley in the opposite direction to the chain on E. Thus, when the overflow vessel is going down, the counter weight is going up.

The wheel C has a ratchet incorporated, so that when the overflow reaches the lowest point of its travel, it may readily be raised again by simply pulling on I. The pronged coupler B engages with two slots in the ratchet wheel, so that the clock is readily disengaged, if necessary. To keep the overflow cradle steady, two wires (H, H) are used as guides, and these are adjustable by wire strainers (L, L). The base of the stand has raised sides, and slopes downward towards the front, to facilitate the collection of spilt mercury.

The reservoir Q is used for filling the bulbs with mercury. It will be observed that, when filling up, a small amount of air will be trapped in the seal N; and it is advisable on this account, when the bulb is almost full, to draw in a small sample of gas by lowering Q, and then expelling again by raising—or, if preferred, the bulbs may be filled upside down with mercury before placing in the stand (a sampler has been designed to obviate this procedure, but has not so far been tested).

The apparatus (in common with most others) suffers from the defect that the rate of sampling is affected by changes of atmospheric temperature, barometric pressure, and gas pressure; but where, as is usually the case, a stream of gas of fairly uniform quality is being sampled, the effect on the composition of the final sample is negligible. The apparatus has been in use for some time now, and all samples taken have been entirely free from air.

Where comparison has been made between samples obtained by mechanical sampling and hand sampling (and the samples obtained by the latter means have been shown by analysis to contain no air), agreement has been excellent in all respects. The only attention required has been the filling up of sample bulbs and the winding of the clock each week. It will be observed that the slow stream of gas into the sample bulbs does not come into contact with any rubber tubing. This is important, in view of the possibility of some constituents of the gas dissolving in, or diffusing through, the rubber.

In the apparatus so far constructed, two types of clock have been used—one for the weekly, and the other for the daily, samples. In each case, the one clock operates two sample bulbs (collecting samples of different gases); but there seems no reason why one clock should not operate more than this number if required, providing all the samples are to be run over the same period.

The PRESIDENT spoke of the utility of gas analyses for the examination of flue gases, and testified to the advantages of the apparatus described for obtaining rapid and accurate information.

VOTE OF THANKS.

Mr. J. H. GEE, in moving a vote of thanks to the authors, remarked on the advantages which the demonstration had over text-book reading. The authors had, he said, personally taken a considerable share in the design of the apparatus. The mechanical gas sampler was a distinct contribution to their means of obtaining accurate and representative samples of gas.

Mr. W. E. CADWALLADER (Birmingham) seconded the resolution and congratulated the authors on the lucidity of their paper and the value of the demonstration.

The resolution was cordially adopted; and the authors, in reply, made due acknowledgment of the assistance rendered by Mr. T. F. E. Rhead (Chief Chemist to the Birmingham Gas Department) and by colleagues at the Central Laboratory, Nechells, and at the Department at the Council House, Birmingham.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

Visit to the National Oil Refineries at Llandarcy.

On Saturday, Dec. 8, members of this Association visited the National Oil Refineries at Llandarcy, Skewen, by kind invitation of the Management. During the inspection of the plant, great interest was shown in the methods employed for treatment of the crude oil, which, it was explained, is pumped direct from the ship to the works by means of electricity. It was stated that a quantity of 14,000 tons of oil is dealt with daily.

Later the visitors were entertained at lunch by the Management; and afterwards Mr. J. L. MURRAY, on behalf of the General Manager (Mr. W. C. Mitchell), welcomed the members.

OIL.

By R. B. SOUTHALL, of the National Oil Refineries.

[EXTRACT.]

Petroleum is one of the most widely distributed mineral products in the earth, and there is probably no other mineral that varies so greatly in its composition and properties, according to its origin. Such differences have made it so far impossible to classify the crude oils systematically, though a general scheme has been adopted.

The crude oil, which is the raw material supplied to this refinery, is obtained from wells in Persia, and belongs to that group known as mixed base crudes. On distillation it yields a residue which contains both paraffin wax and asphalt, as distinct from those whose residues are either mainly paraffin wax or asphalt.

Persian crude oil is a naturally occurring mixture of hydrocarbons and their derivatives, and is a mobile brown liquid with a green fluorescence. Its sp. gr. at 60° Fahr. is approximately 0·840. At the present time it has no commercial application in the raw state, and it is the purpose of the refinery so to treat it that products are obtained of an enhanced economic and utilitarian value.

The first step in this direction is the primary distillation at the crude benches, and from it are obtained the following fractions:

(*a*) Benzene, which is the fuel used in the motor car engines.
(*b*) Vaporizing oil, which is used in somewhat heavier types of engines.
(*c*) "White spirit," used as a substitute for turpentine in the manufacture of paints and varnishes.
(*d*) Kerosene, used fairly extensively as a household illuminant.
(*e*) Long-time burning oil, which is essentially a kerosene of a narrower boiling range, and contains less of the lower boiling-point bodies. It is used in railway signal lamps, &c., and derives its name from the fact that it is intended to burn in lamps where attention to the wick can only be given at long intervals.
(*f*) The residue, which can be used as a fuel, either in burners under boilers, &c., or for heavy internal combustion engines of the Diesel type. It also serves as a base for the production of lubricating oils; and, in fact, part of the production is so utilized in the refinery.

In order to render the benzene suitable for the market, it is necessary to remove bodies which would give the finished petrol an unpleasant odour, and those sulphur compounds which on combustion would do damage to the metal of the engines in which it is used. It has been found possible to oxidize and remove these constituents by bringing the benzene into intimate contact with a dilute alkaline solution of calcium hypochlorite, afterwards removing the reaction products by washing with calcium or sodium hydroxide solutions, and finally washing free from alkali with water. Such a process is carried out in continuously operated plants; the spirit passing into different washers for different stages of the treatments.

Both vaporizing oil and white spirit products receive a wash with F.O.V. or C.O.V., which serves to reduce the sulphur content and to remove hydrocarbons of unpleasant odour. In the case of white spirit, it is especially necessary to obtain a stable sweet-smelling oil; and so it receives a final treatment of hypochlorite and soda such as is applied to benzene.

In order that kerosene shall burn successfully in the usual wick lamps, it is essential that the products of combustion shall not be of unpleasant odour, and also that they shall not stain the lamp glass within reasonable time. The refining of this fraction is therefore arranged to provide an oil which gives satisfactory results. The first step is to mix kerosene with F.O.V., in which compounds of unpleasant odour are soluble or are thereby converted to bodies soluble in alkali, and when the sulphur containing bodies are also practically eliminated. After a neutral oil has been obtained by washing with sodium hydroxide solution, kerosene is still further refined by filtration through roasted bauxite. This serves to take out bodies which would cause the kerosene to be dark in colour, and it also reduces the sulphur content still further. The filtrate is a sweet-smelling water-white product.

VOTE OF THANKS.

The PRESIDENT (Mr. C. B. Felton) proposed that the best thanks of the Association be tendered to the Management and Officials of the National Oil Refineries for making the visit possible, and he thanked Mr. Southall for his paper.

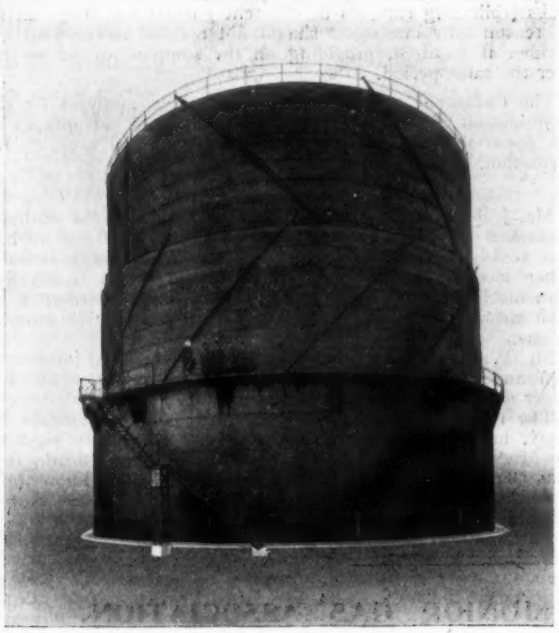
Mr. A. H. SHEPHERD (Swansea) seconded the proposition, and Mr. SOUTHALL responded.

The members then travelled to Neath, where they were met by Mr. W. CLARK JACKSON (Engineer and Manager of the Neath Corporation Gas Department), at whose invitation they took tea at the Castle Hotel.

NEW GASHOLDER AT IRVINE.

Inspection and Inaugural Ceremony.

On Dec. 14, in presence of a company of gas engineers and others associated with the gas industry in Scotland, there was



inaugurated a new gasholder erected for the Irvine Gas Company, Ltd. The inaugural ceremony was carried through by Mrs. HARRY LUMSDEN, the wife of the Chairman of the Company.

The entire constructional work in connection with the new holder was carried through by Broadhead Constructions, Ltd. The contract consisted of a two-lift spiral-guided holder (prepared for a third lift) in steel tank, having a capacity of 250,000 c.ft., together with excavations and reinforced concrete raft, and two lines of connecting pipes to the inlet and outlet of the existing holder.

After the inauguration ceremony, those present adjourned for luncheon to the King's Arms Hotel, in Irvine. Mr. HARRY LUMSDEN, the Chairman of the Irvine Gas Company, occupied the chair.

Following the Loyal Toast,

Mr. CHARLES FAIRWEATHER (Engineer and Manager, Kilmarnock) proposed the toast of "The Irvine Gas Company, Ltd." He remarked that the new gasholder they had inspected was in every respect an excellent one.

Mr. HARRY LUMSDEN, with whose name the toast was associated, made an interesting speech in which he expressed his indebtedness to the Fairweather family for all the assistance they had rendered to the Irvine Gas Company. Mr. Lumsden mentioned that he had been Chairman of the Board for nearly twenty years; and it was one of the most enjoyable offices he had held. When he became a Director of the Company, the first recorded manufacture was under 30 million c.ft. of gas per annum. Now, happily, things had so much changed for the better in the district that they were regularly turning out over 60 million c.ft. of gas a year. The idea of a bigger holder had largely originated with Mr. Johnstone, the Vice-Chairman of the Company.

Other toasts that followed were "The Town and Trade of Irvine," proposed by Mr. HUGH M'QUEEN, and acknowledged by Provost CLARK, J.P., of Irvine; "The Gas Industry," proposed by Mr. MATTHEW SMITH, of Kilmarnock, and replied to by Mr. DAVID FULTON, of Helensburgh; and "The Contractors," proposed by Mr. J. W. M'LUSKY, of Glasgow, and responded to by Mr. H. W. BROADHEAD, of Messrs. Broadhead Constructions, Ltd.

AMERICAN GAS ASSOCIATION CONVENTION.

(*Continued from p. 741.*)

GAS DEHYDRATION.

Work in the Research Laboratories of the Koppers Company has resulted in the evolution of a new process of dehydration specially adapted to the requirements of manufactured gas. A contract has been received from the Grand Rapids Gas Light Company for the construction of a dehydrating plant which is to have a capacity of 10 million c.ft. of gas a day. Upon the completion of this plant, a series of comprehensive tests is planned.

TAR DEHYDRATION.

West's Gas Improvement Company report that the first installation of a Wikner tar dehydrator has been built for the Springfield Gas Company. The dehydration of tar in this still is carried out continuously. Crude tar enters the bottom of a tank, and overflows, after dehydration, at the surface level to the fired stills for further treatment, when such is desired. A tar suitable, in certain circumstances, for road spraying can be obtained from the Wikner outlet. The limiting factors are the nature of the crude tar and the available steam pressure. The operation of the still is exceedingly simple. Heat is supplied by steam coils at the surface of the tar only. The water vapour and naphtha vapours thus driven-off are collected in vertical pipes, and pass backwards and forwards through pipes entirely surrounded by comparatively cold incoming tar, thus pre-heating this tar, and at the same time condensing. The condensate and remaining vapours are collected in a common header, and further cooled-down in a water-cooled condenser. The Wikner still installed at Springfield has a capacity of 50 tons of crude tar a day.

MASTER METERS FOR APARTMENT HOUSES.

In order to understand the problem of the Master Meter Committee, it is necessary to consider significant changes that the last few years have witnessed in apartment building construction in the United States. Formerly, the apartment buildings were the standard three storeys in height, without lifts; whereas nowadays apartment buildings rise to twenty storeys or more, possess lifts, and house from 50 to 200 families. Often they are built on the same ground area that was formerly required for flat buildings housing 12 to 30 families. There are several reasons for these changes in city life. The mounting cost of construction, increasing rates, and the general tendency of the public to take advantage of all convenience and to obtain the maximum of home comforts with the minimum of effort, all combine to favour the change. Gas companies are advised to keep closely in touch with the structural changes that are taking place in the modern type of apartment buildings. The tendency to-day—especially in large cities—is towards smaller apartments; and this carries with it the need for smaller appliances. The demand for gas in these types of apartments is small. This class of customer, if supplied individually, yields little (if any) profit to the gas company, and in most cases is actually carried at a loss. The master meter is the remedy for this situation, since by its use many unprofitable accounts are turned into a single profitable one. For companies whose schedules provide lower rates for volume consumption, master meter installations are a fertile field for the additional sale of gas for various purposes.

SINGLE-METER INSTALLATION.

Pursuing a somewhat similar line of study, it may be pointed out that some time ago the Architects' and Builders' Service Committee agreed that company members of the Association should be asked to discontinue the use of the term "master meter," and to use instead the phrase "single-meter installation," because of the desirability of discouraging the employment of sub-meters or check-meters, which the term "master meter" too often brings to mind. Companies are urged to give serious consideration to the great importance to the industry of the single-meter installation idea, and of the proper control of it.

Representatives of some of the larger companies have reported the growth of a dangerous tendency on the part of apartment and office building landlords to pervert the single-meter plan to a profit-making scheme through the installation of sub-meters or check-meters. Many companies refuse to lease, read, or test gas sub-meters. On the other hand, the Committee report many splendid advantages accruing to companies from the proper promotion of the single-meter idea. Chicago already has over 900 large apartment buildings supplied in this way. In St. Louis few apartment houses are going up nowadays on anything but a single-meter basis—particularly where they are

for above twelve families. The fact that St. Louis papers daily advertise dozens of apartment houses where gas is furnished with the apartments is of great assistance in convincing contractors that it is now standard practice to instal gas piping in apartment houses on the single-meter basis. In Denver there are either built or building approximately 1000 apartments in which the rental includes gas. Denver also reports the securing of considerable water heating business in connection with apartment house single meters, as well as material increases in the domestic gas consumption and revenue per apartment, in addition to the usual advantages of the single-meter plan.

EDUCATION FOR RESPONSIBILITY.

On Friday, Jan. 4, at 2.30, at University College, Gower Street, London, the Association for Education in Industry and Commerce will hold a meeting to discuss "Education for Responsibility." Lord Riddell, the President of the Association, will be in the chair, and there will be three notable speakers. Mr. William Glower, the Chief Officer for Labour and Establishment, L.M.S. Railway Company, will give the experiences of a large industry in organizing an educational system which has given very satisfactory results. Mr. G. H. Gater, Education Officer to the London County Council, will also speak, and Mr. F. W. Goodenough, C.B.E., Chairman of the Board of Education Advisory Committee on Education for Salesmanship, will bring to the discussion a wide knowledge of apprenticeship systems, particularly those of the gas industry. This meeting should give a valuable opportunity for people interested in industry to meet educationists, as it is part of the Annual Conference of Educational Associations which is held at University College from Monday, Dec. 31, 1928, to Saturday, Jan. 5, 1929, under the Presidency of Lord Lytton. Members of the Conference, and holders of invitation cards, will be admitted free; and the general public on payment of 1s. Entrance to the Conference admits also to various exhibits of books and materials used in educational work.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Mr. A. T. Gilbert's Address to the London Juniors.

SIR,—I have read with interest the lecture delivered by Mr. Gilbert to the London and Southern District Junior Gas Association (see "JOURNAL" for Dec. 19, p. 797), and am surprised to note that he speaks of high-capacity meters, front insertion change plate attachment, therm registering meters, and oiling devices as recent introductions. May I advise Mr. Gilbert that the firm of George Wilson Gas Meters, Ltd., made and supplied these specified appliances as far back as ten and twenty years ago.

J. H. WILSON.

Messrs. George Wilson Gas Meters, Ltd.,
Foleshill Road,
Coventry,
Dec. 22, 1928.

Cheaper Gas for Dewsbury.—The Dewsbury Corporation Gas Department have decided to recommend a reduction in the price of gas of 2d. per 1000 c.ft., and to make no charge for meter rents from Jan. 1, 1929. The price of gas was reduced by 3d. per 1000 c.ft. on Sept. 30 last, making a total reduction of 5d. per 1000 c.ft. in less than six months.

Reduced Charges.—The Bridport Gas Company announce that after the meter readings at the end of the December quarter the price of gas for domestic purposes will be reduced from 5s. 3d. per 1000 c.ft. to 5s. per 1000 c.ft., and for power purposes from 4s. 3d. to 4s. Cash discounts according to the quantities consumed per quarter will be allowed, as before, on accounts paid on or before the last day of the month in which they are presented.

Skipton's Proposed Gasholder.—The Skipton Urban District Council's Gas Committee has received protests from various local people against a scheme to erect a gasholder on land proposed to be acquired at Carleton Road. The Clerk to the District Council has been instructed to make full inquiries into the legal position of the objection, and meanwhile to inform the objectors that a definite reply will be given after a report has been received on the nature of the ground.

Stand-by Plant for Rotherham.—On Dec. 18, Mr. J. W. Mason, of the Ministry of Health, held a public inquiry at the Council Hall, Rotherham, relative to the application by the Rotherham Corporation Gas Department to borrow the sum of £10,500 for the erection of a stand-by gas plant, to provide against the possible inability to obtain coke oven gas from the usual sources in the event of strikes or lock-outs at the local collieries. As was mentioned in the "JOURNAL" for Oct. 10 (p. 144), the provision of this stand-by plant is necessary owing to the inadequacy of the present plant in the case of an emergency, and in order to meet the Council's statutory obligations in the event of such emergencies.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF LORDS.

When the Ipswich Gas Order came before the House of Lords for approval on Dec. 19, strong objection was taken to the proceedings by Earl Beauchamp, the Leader of the Liberal Party in the Lords, on the ground that it was being taken before the hour (4 o'clock) at which it was set down on the Order Paper. After considerable discussion, the procedure was regularized by a further motion confirming the approval which had been given to the Order before 4 o'clock. Proceedings on the Burnley and the Petersfield and Selsey Gas Orders were delayed until 4 o'clock on the same grounds, when they, together with the Bishop's Stortford, Bradford, East Surrey, Leek, Rochdale, and Rugby Orders were approved.

HOUSE OF COMMONS.

Gas Legislation.

Lieut.-Col. WINDSOR-CLIVE asked the Prime Minister if he would introduce legislation during the present Session to remove the restrictions which were hindering the development of the gas industry.

Mr. BALDWIN stated in reply that the President of the Board of Trade was in communication with representatives of the gas industry with a view to ascertaining whether a non-controversial Bill could be drafted for introduction this Session.

The Right Hon. F. O. ROBERTS subsequently put a similar question to the President of the Board of Trade, which was answered in the same terms.

Mr. RENNIE SMITH, in a supplementary question, inquired if an application had been received from the Penistone Gas Company.

Sir PHILIP CUNLIFFE-LISTER said that his reply and that of the Prime Minister referred to general legislation on the lines of a non-contentious Bill. He did not think any question of a particular gas company arose.

It is understood that a number of M.P.'s have been writing lately to the Board of Trade urging the immediate introduction of such legislation.

Gas Poisoning.

The Right Hon. C. W. BOWERMAN asked the President of the Board of Trade whether, seeing that since the war the percentage of carbon monoxide, the chief poisonous constituent of coal gas, had been raised from 7 p.ct. to as much as 15 p.ct., and in some cases to as much as 20 p.ct., and that such increase militated against the recovery of persons accidentally poisoned by gas, steps would be taken to ensure that the thermal efficiency was obtained in some manner less dangerous to the general public.

Mr. HERBERT WILLIAMS, Parliamentary Secretary to the Board of Trade, said that the increase in the content of carbon monoxide was due to the increased use of water gas, a development which started long before the war, and which had many advantages. The possibility of safeguards against the dangers arising from the presence of carbon monoxide had been under consideration by various Committees and by the gas industry itself. He would be glad to call the attention of the latter to the question, but the problem was far from easy; and if his questioner had any suggestion to make, he would be happy to consider it.

Mr. BOWERMAN also asked the Home Secretary whether a record was kept of the number of deaths by suicide and accident due to gas poisoning, and, if so, what the numbers were, for the years 1913 and 1927.

Sir KINGSLEY WOOD, Parliamentary Secretary to the Minister of Health, supplied the following figures taken from the Registrar-General's Mortality Statistics:

England and Wales.

Deaths registered during the years 1913 and 1927, which have been classified to gaseous poisoning, distinguishing Accident and Suicide.

Nature of Gas as stated in Death Registers.	1913.		1927.	
	Accident.	Suicide.	Accident.	Suicide.
Coal gas	40	130	148	994
Carbon dioxide	8	2	4	..
Carbon monoxide	11	4	29	..
Other, or not stated, gases, fumes, &c.	30	24	14	4
Totals	89	160	195	998

NOTE.—The number of deaths shown above under "Accident" include a number of cases for which "Open Verdicts" were returned at inquests.

Gas Special Orders.

The House of Commons approved the following Special Orders made by the Board of Trade under section 10 of the Gas Regulation Act, 1920, on Dec. 18: Ipswich Gas Light Company, Borough of Burnley, Petersfield and Selsey Gas Company, Leek Urban District Council, Redhill Gas Company, Rugby Gas Company, Borough of Rochdale, Bishop's Stortford, Harlow, and Epping Gas and Electricity Company (with an amendment), City of Bradford.

Plans have been deposited in connection with the following Special Orders: Bideford, Bury St. Edmunds, Cleveland, Hertford, Andover, and Halstead.

MISCELLANEOUS NEWS.

ALDERSHOT'S PROPOSED AREA EXTENSIONS.

Opposition by the Godalming Gas Company.

The Aldershot Gas, Water, and District Lighting Company have given notice of their intention to apply to Parliament for an Act which, among other things, will give them the right to supply gas to certain districts within the present area of supply of the Godalming Gas Company. The district affected comprises a small portion of the northern part of the Godalming Company's area, and includes Shackleford, Eashing, and part of Compton, which are at present without a supply. Though statutory notice has been given of the Company's intention to promote the Bill, this notice, it is stated, has appeared only in the "London Gazette" and in a paper published at Basingstoke, and the Godalming Gas Company have received no communication from the Aldershot Company of their intentions.

The Directors of the Godalming Company have decided to oppose the Bill. The reason the Godalming Company have not extended their mains to the areas referred to is that they are of a rural character and sparsely populated. There is every possibility, however, that these districts will be considerably developed in a few years time, and should consequently become very valuable from the Godalming Company's point of view. Hence the Company's intention to offer strong opposition to the proposal.

CHAPEL AND WHALEY BRIDGE GAS COMPANY.

Annual Report.

In the annual report of the Chapel and Whaley Bridge Gas Company for the year ended Sept. 30, the Directors stated that the revenue account showed a profit of £4195. To this had to be added the unappropriated balance from the previous year of £3169, making a total of £7364. Against this had to be charged bank interest amounting to £877, and interim dividend and debenture interest amounting to £1843, finally leaving for disposal the sum of £4642, which the Directors recommended should be applied as follows: In paying a final dividend for the year ended Sept. 30 last at the rate of £3 11s. p.ct. (*less* income-tax); in appropriating £610 to the special purposes fund; and in carrying forward to the next account the sum of £2317.

During the financial year a further 1000 shares were applied for and allotted, leaving 5899 shares still available for purchase. In the same period, £20,000 of 6 p.ct. redeemable debenture stock had been offered, of which £13,850 had been issued, leaving for disposal £6150.

It is also mentioned in the report that the new works at Horwich End, Whaley Bridge, have been completed, and that the manufacture of gas commenced last June. The plant, it is stated, is giving every satisfaction.

STOCKPORT CORPORATION APPLY FOR A SPECIAL ORDER.

Board of Trade Inquiry.

On Dec. 7, Mr. J. F. RONCA (Director of Gas Administration) held an inquiry at the Board of Trade Offices, Whitehall, in regard to an application by the Stockport Corporation to amend their existing statutory powers with respect to their gas undertaking, and to extend their limits of supply by the acquisition of the Parish of Woodford and part of the Parish of Poynton-with-Worth in the Rural District of Macclesfield.

Objections to the application were made by the Hazel Grove and Bramhall Urban District Council, the Bredbury and Romiley Urban District Council, and the Cheadle and Gatley Urban District Council, whose districts are within the Corporation's area of supply.

Mr. ROBERT HYDE, the Town Clerk of Stockport, appeared in support of the application; while Counsel for the objectors were Mr. TYLDESLEY JONES, K.C., and Mr. SYDNEY TURNER.

Mr. HYDE, in opening the case, said that the application was made under Section 10 of the Gas Regulation Act. The Borough of Stockport, he said, was situated partly in the County of Chester and partly in the County of Lancaster. Of the total area of 7059 acres, 3610 acres were in the County of Lancaster and 3448 in the County of Chester. The population, according to the census of 1921, was 125,500, and the rateable value £820,237. The circumstances giving rise to the present application was the receipt, on Nov. 29, 1927, of a letter from the Ministry of Health with regard to the application by the Stockport Town Council to borrow £40,000 for the installation of additional plant at their gas-works, and a suggestion that the Council should take steps to bring their undertaking under the provisions of the Gas-Works Clauses Act. Prior to the receipt of that letter, the Corporation had been in negotiation with the Wilmslow and Alderley Edge Gas Company for the purchase of their undertaking in the Parish of Woodford, for which the Corporation had for some time been furnishing the Company with a bulk supply; and those negotiations resulted in the agreement which was contained in the first schedule of the Order. The Corporation had also been supplying in detail a portion of the Parish of Poynton-with-Worth—a parish which was to some extent supplied without statutory powers with gas from the Poynton Collieries of Lord Vernon. The Draft Order was prepared by the Gas Committee of the Corporation, and was approved by the Council on April 4, 1928. The letter from the Ministry of Health was the first suggestion ever made that any alteration of the statutory powers of the Corporation was either necessary or desirable, though the powers of the Corporation had, at various times, been open for review by Parliament and by Government Departments. In fact, upwards of forty loans for gas-works had been sanctioned by the Ministry of Health and their predecessors, the Local Government Board, under a Provisional Order of 1894, without any comment on the legislative powers of the Corporation. The Council, however, agreed to make the necessary amendments, though he wished to make it clear that they were giving up a great deal. If they had adopted the course—which was not unusual in such circumstances—of inviting the intervention of their Parliamentary representatives, he had no doubt they would have obtained a long respite, if, indeed, they had not been altogether reprieved.

Mr. Hyde then gave in considerable detail the history of the Stockport gas undertaking. The powers of the Corporation at the present time were subject to no limitation of price or application of profits, and the supply in every case was a matter of contract and not of obligation. Moreover, the provisions of the Gas-Works Clauses Acts of 1847 and 1871 were not incorporated in the legislation under which the Corporation's gas undertaking was worked, though the powers in many respects were similar to those of the Act of 1847. Nevertheless, these almost unfettered powers, which had stood for some forty years, had never given rise to any complaint or criticism, and there was no allegation of any misuse or unfair advantage being taken of them. All that was, or could be, said about them was that they were not in conformity with modern legislation. When amended, they would be.

DESCRIPTION OF THE UNDERTAKING.

Describing the gas undertaking, Mr. Hyde said that the consumption of gas in 1927-28 within the borough was 921,566,200 c.ft., and outside the borough 110,986,100 c.ft., making a total of 1,032,552,300 c.ft. During the same period the income from the sale of gas within the borough was £155,810, and outside the borough £21,251, making a total of £177,061. There were certain discounts; and these amounted to £15,222, so that the net income from the sale of gas, exclusive of the discounts, was £161,839. The price of gas within the borough was 4s. per 1000 c.ft., and outside the borough 4s. 4d. per 1000 c.ft., *less* in each case a discount of 6d. per 1000 c.ft. to customers who paid their accounts within twenty-one days. Ninety p.ct. of the consumers availed themselves of this. The total capital expenditure on the undertaking was £833,075; the present outstanding debt being £324,736. The average rate of interest paid by the Corporation on that debt was £4 7s. 10d. p.ct. The gas undertaking had, with the exception of a few years during and after the war, been a source of substantial profit to the Corporation; and during twenty-two years to March 31 last, the amount applied in aid of rates had been £173,824, which on an average of the outstanding debt during the same period (£262,081) was equal to 2·98 p.ct. Then again, during the same period loans to the amount of £326,795 had been paid off. The repayments of debt, however, did not keep pace with the new capital, and the outstanding debt had gradually increased. In 1894 it was £139,874. In 1907 it was £246,652; and in 1928 it was £324,736. The last figure excluded £40,000 sanctioned in November, 1927, which had nearly all been expended. The Corporation were about to proceed with the erection of a new 4 million c.ft. gasholder, which would cost about £60,000; and that work would probably have been in hand now but for the death of Mr. S. Meunier, the Gas Engineer of the Borough.

Mr. TYLDESLEY JONES, K.C., inquired whether the Corporation could not be called on to give their supply to a certain portion of the City of Manchester, where they had powers to do so.

Mr. HYDE replied that he did not think so; if they did, they would have to come to some arrangement with Manchester. It was also interesting to note that the cost of gas in Manchester was the same as that supplied by the Stockport Corporation. As a matter of fact, negotiations were in progress with the Manchester Corporation for the exchange of the portion of the area mentioned by Mr. Tyldesley Jones for another district which Manchester had proposed.

THE OBJECTIONS.

Dealing with the Draft Order, Mr. Hyde said that the really important objection from the three opposing Councils related to price and the differential, which were dealt with in Clause 17 of the Order, as follows:

> (1) That the price charged by the Corporation for gas supplied by them to persons who shall consume same by meter shall not at any time exceed: (*a*) Within the borough 13·3d. per therm; (*b*) elsewhere within the limits of supply 0·8d. per therm in excess of the price for the time being charged for gas supplied

in like circumstances and for the same purposes within the borough.

(2) This section shall have effect as though the provisions thereof were contained in an Order fixing a maximum price per therm made on the date of this Order by the Board of Trade under Section 1 of the Gas Regulation Act, 1920.

It would be observed, continued Mr. Hyde, that the prices fixed were the maximum prices, and that the price of 13·3d. per therm was equivalent to 5s. per 1000 c.ft.—a very low figure, when it was borne in mind that in the coal strike they were compelled to charge 5s. 9d., *less* 2d. discount, and 5s. 7d., *less* 2d. discount, in the following year. No less figure than 5s., he contended, would afford any degree of security. In Manchester the maximum prices authorized were 13·3d. per therm, which also equalled 5s. per 1000 c.ft. The Urban Councils appeared to think that a differential charge outside the borough was something unusual, and therefore improper—but the reverse was the case. It would, he thought, prove his case if he showed in evidence that it was more expensive to supply the outer districts than to supply the Borough. These districts were all undeveloped to a large extent, and, having regard to the scattered nature of the houses, it must be obvious to anybody that it was more expensive to supply there than in the Borough itself. At the same time, he argued that the use of the word "differential" was likely to be misleading, because what people in the outer districts required was gas at a reasonable price. Moreover, the proposed differential of 0·8d. was slightly less than the difference now charged; and it seemed to him that the three opposing authorities ought to be supporting instead of opposing the Order. He emphasized the point that the Corporation was not seeking any new powers in this clause; indeed, they were limiting their powers, and conferring very great benefits upon consumers both within and outside the Borough. The objectors asked for the abolition of the differential; but that could only be done at the expense of the consumers in the Borough, and would repeal the existing powers of the Corporation. There were a number of minor objections raised by the opponents, but Mr. Hyde said he would first call his evidence before dealing with them.

Evidence for the Corporation.

Mr. *William Newbigging*, Civil Engineer, of Manchester, said that he was familiar with the Stockport undertaking, and he was of opinion that the works and plant were well designed and well maintained; being modern in construction and economically managed. The maximum producing capacity of the plant was: Coal gas 5,500,000 c.ft., and water gas 1,600,000 c.ft. per day, and, allowing for the margin for repairs, that would bring the working capacity to 5,680,000 c.ft. per day, while the maximum day's consumption was 4,706,000. The working capacity of the plant was 20·7 p.ct. in excess of the maximum output. Witness bore out the figures given by Mr. Hyde in regard to the consumption and mileage of mains and plant installed. He thought that the terms contained in Clause 15 of the Order were necessary for the proper conduct of the undertaking as regards the outside districts, as there were collieries in the immediate neighbourhood, and it might be that they would want to enter into an arrangement to take coke, gas, or residuals. The consumption of gas in the outer district was 49·6 p.ct. less per mileage of mains than that in the town of Stockport. Extra expense had been incurred in the supply of the outer districts, as the Corporation had found it necessary to instal a compressing plant, and to lay a length of high-pressure main in order to give an extra supply at Bramhall; and land had to be acquired. With regard to the Bradbury area, the Corporation had laid a 16-in. low-pressure main, and there was a trunk main running direct through the Borough to the outer district from which no consumption of gas was taken off. Two 35-H.P. compressors had been installed for boosting the pressure of gas; each having a capacity of 24,000 c.ft. per hour. The Corporation made a greater profit out of the consumers of the Borough than they did out of the consumers in the outer districts, and he thought the abolition of the differential would be unfair to the ratepayers of the Borough, who were responsible for the whole of the capital raised.

In cross-examination, Mr. Newbigging said he had no estimate of the cost of the manufacture of gas in Stockport.

Mr. TYLDESLEY JONES: So you are asking the Board of Trade to fix a maximum price for the cost of manufactured gas to-day, when the first essential for them to fix that price is not before the Board of Trade?

Witness replied that he thought what they were asking for was fair.

A long discussion ensued as to the allowing of Clause 17 dealing with the price charged for gas within and without the Borough, the Director of Gas Administration pointing out that 5s. 9d. was the most the Corporation had had to charge for the gas, notwithstanding the fact that they had had bad strikes. It had also been put that the Corporation had been able to look after the undertaking very well. The Director also drew attention to the fact that under Section 2 of the clause revision could be applied for, supposing something quite unexpected happened.

The question of Clause 17 was then considered in private during the luncheon adjournment; and eventually it was decided by mutual consent that Clause 17, Section 2, should be withdrawn.

Advantage from Outside Districts.

Witness, continuing his evidence, pointed out that it was an advantage to the undertaking to have a growth in the number of consumers from the outside districts, which would mean an increased make at the works, enabling the manufacture to be carried out more economically. With regard to some of the districts, the expense of supplying them was greater than in others, and he doubted whether it would be worth while bringing some of them into the area of supply even with the differential. The houses in the Hazel Grove and Bramhall districts were to be found along the main road with roads leading off, and that was where the development was taking place. It was naturally to the interests of the Corporation to obtain more consumers along those main roads.

It was pointed out at this stage that it would be unnecessary for Mr. Hyde to call any more witnesses.

The Case for the Opposition.

Mr. TYLDESLEY JONES, K.C., then addressed the Director of Gas Administration on behalf of the objectors. In view of what had taken place, he said, he was not going to challenge the charge of 13·3d. per therm. It was, in their view at least, a wider margin than he would ask the Board of Trade to allow, if the Corporation had had the opportunity under the Order of revising the price from time to time, which they did not now have. If they were going to allow a margin, acting on the same principle as Parliament had in the past, he was not going to say that 13·3d. was an unreasonable figure to take. When one allowed a wide margin, one did it with the full knowledge that the consumer was going to be adequately protected. The protection of the consumer must be found in the clause which provided for the disposal of any surplus they might have after paying their proper working costs and capital charges. In the present case, the selling price to-day was a figure at which the Corporation were able to supply gas in the year 1926-27, during the most severe coal strike ever experienced within living memory, and at the same time they made a substantial profit. They were also, during that year, able to apply a considerable sum for the purposes which appeared on the face of them to be capital charges. How much of them really represented capital charges, and how much could be justified as revenue charges, one need not stop to inquire. He was not going into the details for the purpose of asking the Board of Trade to fix a figure, but only for the purpose that there would obviously be a very substantial margin—he would not say an unreasonable margin—which made it more imperative that the protection on which they relied—the clause for the application of the surplus—should be made properly effective.

The Surplus.

The surplus in question was after providing for the matters referred to in Clause 43; and those matters included the provision of a reserve fund. There was no limitation at all on the amount which they might put in any one year to the reserve fund, except that the total amount in that fund must not exceed one-tenth of the capital expenditure. The aggregate capital expenditure, for the time being, was the aggregate of all sums they had spent on capital account. It did not mean the loans outstanding, and they had in the present case a good illustration of the absurdity of that. There were two gas-works, one used formerly for the manufacture of gas (now given up), and the other which had been erected since. It was entirely optional to the Corporation whether they ever wrote their accounts down in writing-off the amount of capital they expended in the past on works which they had scrapped. He was going to ask that they should put in the clause (as Manchester had done in its Act of 1921) a provision that the Corporation were not to put to the reserve fund in any one year more than a certain percentage—it was ¼ p.ct. in the case of Manchester. If they amended Clause 42 in that way, then, under Clause 43, sub-section 1 (*e*), the amount that could be charged against revenue was properly limited. If it were so properly limited he agreed that the Corporation must be entitled to pay out of their revenue the moneys referred to in Clause 43 (1). The Corporation asked them to apply the surplus either in the reduction of the charges for gas, or in the reduction of capital and money borrowed for the purposes of the gas undertaking. This was absolutely unsound in principle, as the ratepayers or consumers of to-day ought to bear only their fair burden of the undertaking, whether it was carried on in the Borough as a whole or not. They should not be taxed to give posterity the benefit. The Corporation could, at present, pay in whatever money they like to the reduction of the capital expenditure, and that was making the people of to-day pay for that expenditure which should be spread over a number of years. He was going to ask the Board of Trade to say that the Corporation of Stockport, which, presumably, were carrying on the undertaking in the interests of the public generally, ought not to be allowed to make a profit in relief of the rates, as there was no safeguard to the consumers who were dependent on the undertaking for the supply of gas. Then, the last section of Clause 44 said, "but this section shall not be deemed to prevent the Corporation from making such charges for the supply of gas as will provide a balance on revenue account at the close of any financial year of such amount as they may think necessary for the purpose of carrying on the gas undertaking, and paying the current expenses thereof." The carrying-on of the gas undertaking included its extension, or enlargements, by expending money which might be charged to the capital account. The whole scope of the Clause, wide as it was in the early part, had taken away all the restrictions of those last few words, as they left it in the hands of the Corporation to pay the current expenses. Therefore he asked that this wording should be deleted from the Clause.

Continuing, Mr. Tyldesley Jones said he had withdrawn his objection to the charge of 13·3d., and he wished now to deal with the differential. Mr. Newbigging had said that it was not fair to impose upon the consumers in the Borough the cost of certain plant, as they did not benefit from it. He asked the Board of Trade, in reply to that, not to draw a distinction between the various districts. If they were going to justify differential on the basis of the increased cost of supplying the outer district, he contended that they could not put that cost on one district and not on the others. Differential, he claimed, was rather out of date. If they took off a number of the districts they were supplying, could the Corporation hope to go on reducing their costs to the consumers in Stockport? Were not the consumers of Stockport going to benefit in the future by reason of the increased make of gas at the Stockport Works? The Stockport consumers were going to benefit through bringing in the outside consumers, and they should bear their fair share of the costs which the

undertaking would thus incur. Various other minor objections were then dealt with by Counsel.

Serious Limitations.

Mr. Hyde, in his reply, pointed out that, in considering the question and the effect of the Order on the Stockport Corporation, they must bear in mind that the powers being sought were really a limitation of existing powers, which had been in operation for a great number of years without causing any dissatisfaction. And, therefore, in his opinion, the consideration which applied to the circumstances to-day were entirely different to what would apply to a new undertaking. All the alterations were very serious, and effected a drastic change in the Stockport Corporation gas undertaking. Bearing these points in mind, he thought it should be conceded that what the Corporation now were proposing, in every financial clause in the Order, was a very reasonable proposition, supported not merely by the evidence that had been given to justify the various propositions or the differential charges, and the amount to be applied to the rates, but also having regard to the fact that in every respect the undertaking, under the new regime, would benefit very considerably. In addition to that, one must also bear in mind that if the observations made by the learned Counsel were to be given effect to, he would no longer be able to use the words "our undertaking," because it would be the undertaking of the outside districts. They would not be able to run the works for the benefit of their own consumers, but for the benefit of the outside consumers. All that the opposition had said was merely supported by arguments. Of course he could not be expected to traverse everything that had been said by Mr. Tyldesley Jones, but he felt that he must say that he was in entire disagreement with very nearly the whole of the observations of the Counsel for the objecting parties.

The proceedings then terminated, and a decision will be announced later.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

Bideford Gas and Coke Company, Ltd.

To extend the limits of supply, and to empower the Company to apply any moneys which they are for the time being authorized to use for the purposes of their gas undertaking towards the payment of the price for the purchase of any gas undertaking which they have acquired, or may acquire, including the gas undertakings of the Westward Ho! and District Gas Company, Ltd., and the Northam, Appledore, and District Gas Company, Ltd.

Chesham and District Gas Company.

To authorize the Company to use scheduled land for gas purposes.

Halstead Gas Company, Ltd.

To extend the limits of supply, to increase the capital, and to prescribe the therm basis of charge.

DECLARATION OF CALORIFIC VALUE.

Haslemere and District Gas Company.—500 B.Th.U. (April 1, 1929.)

CONSUMERS' GAS COMPANY OF TORONTO.

An Eminently Satisfactory Year.

The eightieth annual report of the Consumers' Gas Company of Toronto for the year ended Sept. 30, 1928, shows that the past year has been one of continued growth, the volume of gas output being substantially in excess of preceding years. On Sept. 4 last, a total volume of 20,108,000 c.ft. of gas was distributed, constituting a record output for a single day. The total number of gas meters in service at the close of the year was 160,347—a net gain of 4617 during the year. There were slight reductions in the unit prices of gas coal and gas oil, though the prices of these commodities are still 60 p.ct. and 125 p.ct. in excess of their respective prices prior to 1915.

The amount spent on repairs and renewals was $689,281. No additions have been made to the manufacturing plant during the year, though extensions have been made to the distribution system where there has been a reasonable demand for gas service.

In order to provide much needed office accommodation, and to take care of future requirements, the Directors, in February last, purchased premises adjoining the Company's present office buildings in Toronto Street, thus acquiring a total street frontage of 204 ft. The Commercial Department's activities have resulted in an increased volume of sales of approved gas appliances. The increase in the sale of gas for domestic purposes represents, in a very considerable degree, the results of the efforts of this department through its "Home Service" lectures and demonstrations. The use of gas in industry continues to develop rapidly. During the past three years the amount of gas sold for industrial purposes has increased more than 50 p.ct.

In moving the adoption of the report at the annual meeting of the Company, the President, Mr. A. W. Austin, stated that the population in the suburban areas had increased 165 p.ct. during the last ten years, and the problem which would confront the Company would be to meet, adequately and effectively, the demand for gas service which would arise as a result of the undoubted future growth of the City of Toronto and its immediate vicinity. He expressed his appreciation of the loyal, able, and untiring efforts of the staff in carrying on the operations of the Company during what could be regarded as an eminently satisfactory year.

CARBONIZATION OF KENT COAL.

Suitability of Low-Temperature Treatment.

At the Thirty-Ninth Ordinary General Meeting of the shareholders of Messrs. Dorman Long & Co., Ltd., which was held at Middlesbrough on Dec. 18, Sir Arthur J. Dorman, Bart., K.B.E., the Chairman, referring to Kent coal, said that the peculiar circumstances of Kent, and the quality of the coal, made it a very suitable place to adopt the low-temperature carbonization process. An exhaustive examination by their own Technical Adviser, Dr. Roelofsen, had induced Messrs. Pearson & Dorman Long, Ltd., to adopt a process which was believed to be suitable for the quality of coal obtained in that county. A plant for putting the process into operation was being erected, and would, it was anticipated, be at work in the course of the next twelve months.

Low-temperature carbonization had received considerable attention in the Press, he continued, but he would like to add a word of warning in view of the glowing accounts that had appeared from time to time, for, despite preliminary work done, largely of an experimental nature, in his opinion it was not right to say that low-temperature carbonization of coal was, as yet, an assured economic proposition. He thought, however, that the fact that Messrs. Pearson & Dorman Long, Ltd., had placed this order showed their confidence in the ultimate success of the process.

At their Redcar Works, owing to the slackness in the shipbuilding trade, orders had not been too plentiful. Their output of coke was 818,000 tons; and among the bye-products was 3,300,000 gallons of crude benzole, all of which was rectified. They had supplied the Middlesbrough Corporation with 1080 million c.ft. of coke oven gas, and the amount of electricity generated at the works from blast furnace gas and waste steam had been 96 million units.

PROPOSED DECREASE IN PRICE AT GLASGOW.

Concession to Domestic Consumers.

The Gas Committee of the Glasgow Corporation, on Dec. 17, unanimously recommended that a reduction of 2d. per 1000 c.ft. be made in the price of gas to domestic consumers as from March 1 of next year. Should this recommendation be approved by the Corporation, the price will from that date be 3s. 6d. per 1000 c.ft. It is estimated that this concession will effect a saving of approximately £25,000 to domestic consumers in the current financial year, which will close on May 31 next.

This decrease will be the fourth made by the Committee in two years. The price of gas in Glasgow reached its highest point after the coal dispute of 1926, when, by a Special Order of the Board of Trade, it was raised over the maximum of 4s. 7d. to 5s. 2d. per 1000 c.ft. Subsequently the cost was lowered to 4s. 3d., while in March of the present year it was decreased to 3s. 11d., and in September to 3s. 8d.—the present price. The new rate proposed will still be 4d. higher than that charged prior to the coal dispute. The position will again be reviewed in July, when the results of the year's working will be considered by the Committee.

It may be recalled that in August last the Manager, Mr. J. W. McLusky, estimated that the Department would finish the year with a surplus of £262,000. At that time the coal for the year was purchased, but considerable doubt existed regarding the prospects for the sale of tar and liquid bye-products. This, it is stated, is the only disturbing feature in the results of the Department's trading during the half-year just ended. The cost of coal to the Department averaged 17s. 9d. per ton delivered at the works, and the sales of gas and coke have come up to expectations. All other costs were as estimated in August last.

The Manager estimated that, if the experience of the ensuing six months is similar to that of the half-year just closed, the surplus on the full year's trading will probably work out at approximately £230,000. The proposed decrease of 2d. per 1000 c.ft. will, however, have the effect of reducing this estimated surplus to about £200,000.

DIARIES, CALENDARS, &c.

Further seasonable gifts in the form of diaries, calendars, and other office requisites are to hand:

Clayton, Son, & Co., Ltd., Hunslet, Leeds.

Leistikow, Allison, & Lyon, 18-19, Southampton Buildings, London, W.C. 2 (A. Borsig G.m.b.H. Berlin-Tegel).

Standard Furnace and Setting Company, 17, Market Street, Southport.

TRADE NOTES.

The "Wooton" Lantern.

The "Wooton" lantern, as produced by Messrs. S. Smith & Sons, Ltd., of Cricklewood Works, N.W. 1, is already used by a large number of gas companies throughout the country, and the latest safety model, Type "D," which has been fully approved, is worthy of a place in every gas-works. The switch is enclosed in a gas-tight compartment, and means are provided to prevent the lamp from being opened by unauthorized persons. As with the other types, it will give 12 to 13 hours light at the cost of a fraction of a penny. The accumulator cannot be spilled, and, it is claimed, will give four or five years' service. Owing to the largely increased demand recently, the manufacturers have been able to reduce the price.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

As is usual at this time of the year, little new business is being done. Efforts are being concentrated on completing shipments previously arranged with the holidays in view. The collieries are mostly well sold on paper; but once again tonnage is scarce, and this is leading to a rather weaker position than would otherwise have been the case. Little attention is being paid to new orders for early January, and inquiry is likely to be quiet until after the New Year holiday.

Gas coals are in satisfactory demand; but supplies are ample, and quoted prices show no change. Wear Specials are nominally 15s. to 15s. 3d. f.o.b., best qualities 14s. 9d., and others 13s. to 13s. 6d. Durham coking is unchanged at 13s. to 13s. 6d., best unscreened bunker coal 14s., and ordinaries 13s. to 13s. 3d. Northumberland screened steams remain firm at 14s. to 14s. 3d. for best qualities.

Gas coke is, if anything, easier, and prompt tonnage required. Shipment prices are nominally 18s. 6d. to 19s. f.o.b.

YORKSHIRE AND LANCASHIRE.

Gas and other public utility concerns appear to have accumulated sufficient stocks to prevent any anxiety during the holiday period, which in Northern coalfields will last from three days to a week. Although the heavy fog lately experienced rather upset traffic arrangements, satisfactory deliveries have been forthcoming.

Coking coal has been in brisk demand, as only a limited holiday will be given in this direction.

Demands for industrial fuel have been rather spasmodic. For the first part of last week there was a strong request for washed nuts; but during the last few days the position has been somewhat easier, and supplies have been available to meet any temporary difficulties.

There has been an increased demand for all descriptions of domestic coal during the past week. Secondary qualities of house varieties are still in chief request, although there is a better demand for the higher grades than was the case a short time ago. Merchants have been able to execute orders without delay, and collieries have, in the majority of cases, completely cleared out recently accumulated stocks.

MIDLANDS.

No coal will be raised in the Staffordshire and Warwickshire coalfields until Thursday, and probably very little then. Prior to Christmas a buying spurt was experienced, and, short-lived though it was, it was both welcome and opportune. Demand ran on domestic coal, and for supplies of D.S. nuts and slacks for hospitals and kindred institutions, to tide them over the Christmas Holidays. One consequence was that best house coal, without being quotably dearer, underwent a hardening tendency, and full prices were also asked for nuts and beans. Slacks were scarcely affected, and supplies were always equal to consumptive demand. Collieries are not carrying the large stocks they did in the early autumn, but no necessity has arisen to augment output.

Collieries that come within the Five Counties Scheme continue to do not more than from three to four days a week, which is sufficient for their quota; some of those outside the scheme are liable to operate almost, if not quite, a full week. Not being bound by price or other restrictions, they are in a position to find a wider outlet for their output, and are taking advantage of it.

Opening of Inverness Plant Extension.—The extensions to the Corporation Gas-Works at Inverness, costing over £20,000, were formally opened on Dec. 20, on the 102nd anniversary of the introduction of gas to the town. The extensions comprised a new retort house, condensers, purifiers, and other plant. Provost A. M. MacEwen set the new machinery in motion, and the Town Council and representatives from neighbouring burghs inspected the extension. It was stated by Mr. A. Thomson, the Manager, that the new retorts were capable of producing over 400,000 c.ft. per 24 hours.

A Question of Insurance.—At Leeds Assizes, on Dec. 19, the Garforth Gas Consumers' Company secured judgment in an action against Charles William Campbell, underwriter, for indemnity in respect of a claim under the Workmen's Compensation Act. The action related to the death of an employee of the Company who was killed in November, 1927, while removing slates to see whether a wall was safe to carry a tank. The defendant's case was that such work did not fall within the work of the Company, as covered by the insurance. The plaintiffs explained that the gas undertaking was a small one, employing only a manager and seven others, and that it was quite usual in such an undertaking for the men to do various kinds of work. His Lorship, Mr. Justice Roche, found that the work was an essential part of the Company's ordinary business, and gave judgment for the plaintiffs.

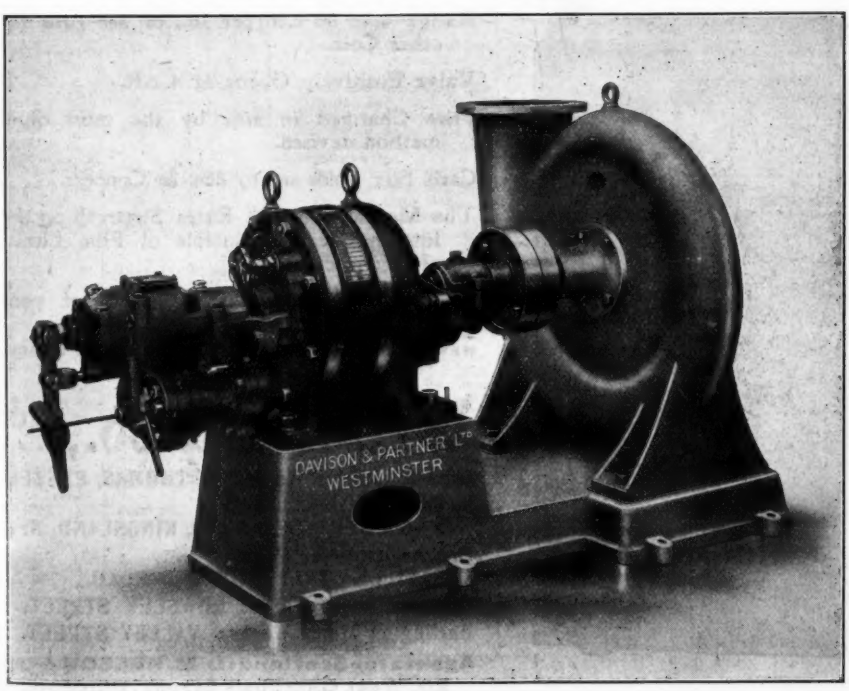
The Pudsey Gas Company were donors of £20 to the Leeds Infirmary Radium Fund, and were among the earliest business undertakings to become contributors.

To mark their appreciation of the achievement of Miss Ellen Wilkinson, M.P. for Middlesbrough East, in persuading the Kitchen Committee to permit women guests to be entertained in the Strangers' Dining Room at the House of Commons, a few bachelor members of Parliament, representing all parties, are to present her with a New Year gift of a gas cooker fitted with automatic oven heat control.

DAVISON & PARTNER, Ltd.

11, Carteret St., Westminster, S.W. 1,

WATER-GAS SPECIALISTS.



Turbo-Blowers

Electric Blowers

Galvanised Blast Mains

Blast Main Dampers

Efficient High Pressure Blowing Sets mean :—

SHORTER BLOWING PERIODS.

INCREASED MAKE PER MINUTE.

INCREASED GAS-MAKING TIME PER SHIFT.

Write for further information.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Dec.* 22.

The market for tar products continues steady. There is a fair demand for tar spirits, and prices are firm. Current values are as follows:

Pitch, about 40s. per ton.
Creosote, about 7d. per gallon.
Pure benzole, 1s. 9d. to 1s. 10d. per gallon.
Pure toluole, about 2s. 1d. per gallon.
Solvent 95/160 naphtha, 1s. 6½d. to 1s. 7d. per gallon.
Pyridine, about 4s. 6d. per gallon.

Tar Products in the Provinces.

Dec. 20.

There are no variations of importance in the market for tar products.

Pitch is still quiet; but one or two orders have been placed on the basis of 37s. to 37s. 6d. f.o.b.

The creosote market is decidedly quiet, and there is a considerable quantity offering. The export market remains unchanged, and good prices are still being realized. For home consumption, however, makers have been accepting very much lower figures.

Water-white products are still very firm indeed, and there is a good deal of inquiry for delivery over the first six months of next year for all qualities, but makers are refusing to sell except for prompt delivery.

Carbolic acid is unchanged.

Cresylic acid is steady for the better grades; but the poorer qualities are still difficult to sell.

Naphthalene is firm, and the price remains unaltered.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s. Pitch—East Coast, 36s. 6d. to 37s. 6d. f.o.b. West Coast—Manchester, 31s. 6d. to 32s.; Liverpool, 33s. 6d. to 34s. 6d.; Clyde, 33s. 6d. to 34s. 6d. Toluole, naked, North, 1s. 5d. to 1s. 6d. nominal. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 1½d. to 1s. 2d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid, 4⅞d. to 5⅛d.; salty, 4⅝d. to 5d.; Scotland, 4⅝d. to 5d. Heavy oils, in bulk, North, 8¼d. to 8½d. Carbolic acid, 60 p.ct., 1s. 11d. to 2s. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

With reference to the prices appearing in the "JOURNAL" for creosote during the past few weeks, we have been approached by some of our readers who advise that they have been unable to secure the prices equivalent to the figures appearing therein; and while these prices do fairly represent the value of exported oil, yet a fair amount of business has been done for home purposes at less money, and taking this into consideration we think it would be fair if the prices appearing in the "JOURNAL" for creosote for the month of December were amended as follows:

CREOSOTE—NORTH (Liquid).

Dec. 4	5⅜d. to 5⅝d.
,, 10	5¼d. ,, 5½d.
,, 17	5⅛d. ,, 5⅜d.
,, 20	4⅞d. ,, 5⅛d.

CREOSOTE—SALTY AND SCOTLAND.

Dec. 4	5¼d. to 5½d.
,, 10	5⅛d. ,, 5⅜d.
,, 17	5d. ,, 5¼d.
,, 20	4¾d. ,, 5d.

This will also have an effect on figures appearing for crude tar, which have also to be amended to read as follows:

TAR.

	s. d.	s. d.
Dec. 4	28 0 to	33 0
,, 10	26 6 ,,	31 6
,, 17	26 0 ,,	31 0
,, 20	25 0 ,,	30 0

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole	0 10 to	0 10½	per gallon at works
Motor ,,	1 4 ,,	1 4½	,, ,, ,,
90 p.ct. ,,	1 7 ,,	1 8	,, ,, ,,
Pure ,,	1 10 ,,	1 11	,, ,, ,,

CONTRACTS OPEN.

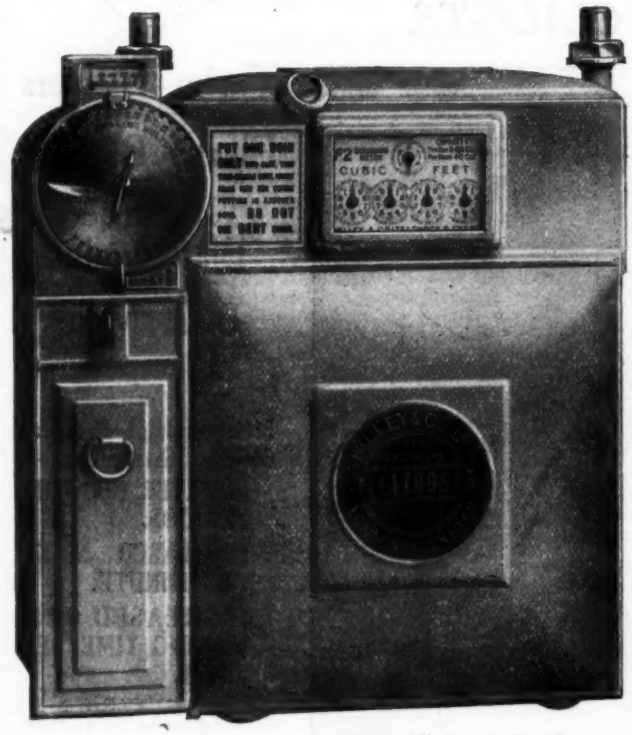
Coal.

The Wallasey Corporation invite tenders for the supply of gas coal and nuts. [See advert. on p. 872.]

Gasholder, Tank, &c.

The Gas Committee of the Cowes Urban District Council invite tenders for the supply, delivery, and erection of a water sealed gasholder, with tank, valves, &c. [See advert. on page 872.]

PERFECTION.



All Mechanism and Coin Insertion Slot in Front.

Range 4 to 50 c.ft. per 1d., or *pro rata* for other Coin.

Valve Positively Opens at 4 c.ft.

Price Changed *in situ* by the most rapid method devised.

Cash Box holds up to 80s. in Coppers.

The Mechanism is of Extra Strength on the Interchangeable Principle of Fine Limits of Accuracy.

Try a Sample; we are confident of your approval.

NEW STANDARD PATTERNS SUPPLIED *EX* STOCK.

WILLEY & Co., Ltd.

Chief Offices and Works: St. THOMAS, EXETER.
London Offices and Works:
89-95, HERTFORD ROAD, KINGSLAND, N. 1.
Manchester Meter Works:
SAVILLE STREET, OXFORD ROAD.
Leicester Meter Works: ROWSLEY STREET.
Darlington Meter Works: VALLEY STREET.
Agents for Scotland: D. M. NELSON & Co.
20, West Campbell Street, Glasgow.

STOCK MARKET REPORT.

WITH the encouraging news regarding the King's illness, a cheerful tone prevailed on the Stock Exchange towards the end of last week. The gilt-edged market was also favourably influenced by the satisfactory result of the issue of the 4½ p.ct. Treasury Bonds, 1932-34. A general rise took place in Home Railway stocks, and Industrials had a stronger appearance.

In the Gas Market, Continental Union ordinary continued to be the sensation. On Friday the highest transaction recorded was 110, as compared with an average quotation of 38½ a fortnight ago. It is a remarkable rise, and opinion in the market is that the terms of the proposed reorganization should be announced without delay. Another increase of importance was that of the Imperial Continental ordinary stock, which rose 31½ points last week to 195-205. Considerable interest is being taken in the terms of the proposed consolidation of the Wandsworth, Wimbledon, and Epsom Company's six classifications of ordinary stock which is made more complicated by there being two standard prices. Under the new Bill being introduced this Session, it is proposed to convert the whole of the stocks into 5 p.ct. consolidated stock, subject to basic-price dividend conditions similar to those of the South Metropolitan and other companies. Of the 5 p.ct. consolidated stock, holders of "A" stock will receive £129, "B" stock £107 10s., "C" and New Stock £90, Wimbledon stock £105 10s., and Epsom stock £109. The Bill also proposes to convert the 3 p.ct. and 4 p.ct. debenture stocks into 5 p.ct. debenture stock, and to consolidate the converted stocks with the existing 5 p.ct. stock. Holders of the 3 p.ct. debenture stock will receive £60 consolidated 5 p.ct. debenture stock, and holders of the 4 p.ct. debenture stock will receive £80 of the consolidated 5 p.ct. debenture stock.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Dec. 21.	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 30	5	5	Aldershot 5 p.c. max. C.	72—77	..	..
412,992	,,	,,	4	4	Do. 4 p.c. Pref.	69—72	..	..
1,551,868	,,	Sept. 27	7	7½	Alliance & Dublin Ord.	96—99	..	..
374,000	,,	July 12	4	4	Do. 4 p.c. Deb.	63—66	..	..
522,554	,,	Aug. 30	7	7	Barnet Ord. 7 p.c.	114—117	..	..
300,000	1	Oct. 11	1/7½	1/4⅝	Bombay, Ltd.	20/—22/-	..	22/-
170,000	10	Aug. 30	8½	8½	Bournemouth 5 p.c.	123—132	..	..
500,050	10	,,	7	7	Do. B 7 p.c.	120—122	..	122
375,000	10	,,	6	6	Do. Pref. 6 p.c.	11—11⅛	..	11⅛
50,000	Stk.	July 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	75—78	..	..
357,900	,,	Aug. 30	7½	7½	Brighton & Hove 6 p.c. Con.	115—118	..	116½—118
341,880	,,	,,	6½	6½	Do. 5 p.c. Con.	101—104	..	..
1,287,500	,,	July 26	5	5	Bristol 5 p.c. max.	91½—92¼a	−½	..
855,000	,,	Sept. 27	7	8	British Ord.	115—118	..	116½—117½
100,000	,,	Dec. 20	7	7	Do. 7 p.c. Pref.	112—115*	−2	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	73—76*	−1	..
200,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	93—96*	−2	..
100,000	10	Dec. 6	8	6	Cape Town, Ltd.	7⅞—8⅛	..	..
100,000	10	Oct 25	4½	4½	Do. 4½ p.c. Pref.	6¾—7¼	..	..
150,000	Stk.	Dec. 20	4½	4½	Do. 4½ p.c. Deb.	71—76*	−2	..
636,860	,,	July 26	6	6	Cardiff Con. Ord.	97—100	..	..
287,860	,,	June 28	7½	7½	Do. 7½ p.c. Red. Deb.	100—103	..	..
157,150	,,	Aug 16	5	5	Chester 5 p.c. Ord.	88—93b	..	..
79,185	1	Oct. 11	1/2-	1/9-	Colombo Ltd. Ord.	41/—43/-	..	..
24,495	1	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	21-/—23-	..	22/10½
375,402	1	Oct. 11	1/92	1/9½	Colonial Gas Assn. Ld. Ord	24/—26/-	..	..
187,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	21/—23/-	..	..
2,073,280	Stk.	July 26	7	5	Commercial Ord.	98—101	..	99½—100½
475,000	,,	Dec. 20	8	8	Do 8 p.c. Deb.	56—59*	−1	59½—60
800,000	,,	Sept. 27	11	11	Continental Union, Ltd.	105—115	+45	65—110
200,000	,,	,,	7	7	Do. 7 p.c. Pref.	95—100	+3	..
787,560	,,	Aug. 16	7	7	Croydon sliding scale	110—113	..	112—113
403,100	,,	,,	5	5	Do. max. div.	84—87	..	86—87
492,270	,,	Aug 16	10	7	Derby Con.	115—120e	..	..
55,000	,,	June 28	4	4	Do. Deb.	71—78e	..	..
309,000	,,	Aug 30	5	5	East Hull Ord. 5 p.c.	75—78	..	..
1,002,180	10	Sept 13	16	14	European, Ltd.	87—92½	+⅜	9⅛—9½
18,703,480	Stk.	July 26	5/1/4	5½	Gas Light & Coke 4 p.c. Ord.	18/7½—19/1⅜f	..	18/7½—19/-
2,600,000	,,	,,	8½	8½	Do. 8½ p.c. max.	62½—64½	..	63½—64½
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—81	+1	78½—81
5,602,620	,,	Dec. 20	8	8	Do. 8 p.c. Con. Deb.	59—61*	−1	60—61½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105*	−2	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	98—100*	−2	100⅝
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug 30	6⅔	7	Hastings & St L. 5 p.c. Conv	95—100	..	..
258,740	,,	,,	5⅔	5⅔	Do. 8½ p.c. Conv.	75—80	..	..
70,000	10	Oct 11	10	10	Hongkong & China, Ltd.	18—14	..	..
173,200	Stk.	Aug 30	5	5½	Hornsey Con. 3½ p.c.	88—91	..	..
1,976,000	,,	Nov. 8	10	10	Imperial Continental Cap.	165—205	+31½	169½—202
223,130	,,	Aug 16	8½	8½	Do. 8½ p.c. Red. Deb.	67—69	..	..
235,242	,,	Aug. 16	7	7½	Lea Bridge 6 p.c. Ord.	116—121	..	..
2 145,907	,,	Aug. 16	5½	5½	Liverpool 5 p.c. Ord.	90½—91b	..	..
600,000	,,	Sept 27	7	7	Do. 7 p.c. Red. Pref.	101—102b	..	..
165,786	,,	Aug. 14	8	9	Maidstone 5 p.c. Cap.	122—127	+2	125—125½
63,480	,,	Dec. 20	3	3	Do. 3 p.c. Deb.	54—57*	−1	..
75,000	5	Dec. 6	18	18	Malta & Mediterranean	5½—5⅝	..	..
541,920	Stk.	Nov. 22	17	15	Montevideo, Ltd.	96—97*	..	..
2,031,515	,,	Aug. 16	5	5	Newcastle & Gateshead Con.	16/6—17/-df	+/3	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	71½—72½d	..	..
691,705	,,	Dec. 20	8½	8½	Do. 8½ p.c. Deb.	68—69d*	−1½	..
131,780	,,	Aug 30	6/18/0	7/1 0	North Middlesex 6 p.c. Con.	102—107	..	..
300,000	,,	Nov. 22	7	9	Oriental, Ltd.	112—115	..	113—115
188,120	,,	Dec. 20	7½	8	Plym'th & Ston'house 5 p.c.	108—111*	−2	..
414,500	,,	Aug. 30	7½	7½	Portsm'th Con. Stk. 4p.c. Std.	109—112	..	..
286,782	,,	,,	5	5	Do. 5 p.c. max.	79—82	..	..
2,334,464	1	—	—	—	Primitiva Ord.	25/6—27,6	+2,6	24/-—26/7½
244,500	100	Dec. 8	4	4	Do. 4 p.c. Red. Deb.	91—94	..	..
695,000	Stk.	July 26	4	4	Do. 4 p.c. Red. Deb. 1911	79—81	+1	80
416,345	,,	Dec. 20	4	4	Do. 4 p.c. Cons. Deb.	78—80*	..	..
150,000	10	Sept. 27	6	6	San Paulo 6 p.c. Pref.	8½—8⅝	..	..
270,000	Stk.	Aug. 30	6	6½	Sheffield A	104—105e	..	..
419,968	,,	,,	6	6½	Do. B	104—105e	..	..
1,047,000	,,	,,	6	6½	Do. C	104—105e	..	..
90,000	10	June 14	13	14	South African	4—6	..	..
6,809,895	Stk.	July 26	7½	5	South Met. Ord.	106½—108½	..	107—108
500,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	110—113	..	..
1,895,445	,,	July 12	8	8	Do. 8 p.c. Deb.	59—61	..	..
784,000	,,	Sept 13	6½	6½	Do. 6½ p.c. Red. Db.	100—102	..	102
91,500	,,	Aug. 16	8½	8½	South Shields Con.	109—110d	..	..
1 243,795	,,	July 26	6½	6½	South Suburban Ord. 5 p.c.	108—111	..	..
868,837	,,	Dec. 20	5	5	Do. 5 p.c. Deb.	96—99*	−2	..
647,740	,,	Aug. 30	5	5	South'mpton Ord. 5 p.c. max.	77—79	..	78½
121,275	,,	Dec. 20	4	4	Do. 4 p.c. Deb.	71—74*	−1	..
250,000	,,	Aug. 30	7	7	Swansea 7 p.c. Red. Pref.	101—103	..	..
200,000	,,	Dec. 20	6½	6½	Do. 6½ p.c. Red. Deb.	99—101*	−2	..
120,000	,,	July 26	7½	8	Tottenham District A 5 p.c.	117—122	..	..
882,275	,,	,,	6½	6½	Do. B 8½ p.c.	100—103	..	103
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	96—99	..	..
181,255	,,	Dec. 6	4	4	Do. 4 p.c. Deb.	75—78	..	..
339,094	,,	Aug. 30	6⅝	6⅝	Uxbridge, Maidenhead, & Wycombe 5 p.c.	93—98	..	..
88,880	,,	,,	5	5	Do. 5 p.c. pref.	87—92	..	..
30,000	,,	July 12	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	120—125	..	..
355,698	,,	,,	7	7½	Do. B 8½ p.c.	113—118	..	..
432,535	,,	,,	5/19/0	6½	Do. C and New	99—104	..	..
332,000	,,	,,	6⅝	6⅝	Do. Wimbledon 5 p.c.	107—112	..	111½
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c.	115—120	..	..
300,000	,,	,,	5	5	Do. 5 p.c. Pref	88—91	−1	..
88 416	,,	Dec. 20	8	8	Do. 8 p.c. Deb.	£6—59*	—	..
234,748	,,	,,	4	4	Do. 4 p.c. Deb.	75—78*	−1	..
207,500	,,	,,	5	5	Do. 5 p.c. Deb.	96—98*	−2	..

Quotations at:—*a*—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *f*.—The quotation is per £1 of Stock * Ex div. † Paid free of income-tax. ‡ For year.

The following transactions were recorded during the week:

On Monday, Brighton and Hove 6 p.ct. 116¼, 118, Bristol 90½, British 116½, 117½, Colombo 7 p.ct. pref. 22s. 10½d., Commercial 100, 3 p.ct. deb. 59¼, Continental Union 65, 70, 70½, 71, 72, 72½, 73, 75, 76, 80, European 8⅛, 8⅜, 8½, Gas Light and Coke 18s. 9d., 18s. 11½d., 19s., 3½ p.ct. max. 63½, 63⅝, 64, 4 p.ct. pref. 80, 3 p.ct. deb. 60¼, 60½, 5 p.ct. deb. 100¾, Imperial Continental 168½, 170, Primitiva 24s., 24s. 1½d., 24s. 3d., 24s. 6d., South Metropolitan 107, 107¼, 107⅜, Southampton 5 p.ct. 78¼, Tottenham "B" 103. Supplementary prices, Bristol 4 p.ct. deb. 74⅜.

On Tuesday, British 117, 117½, Commercial 100½, Continental Union 82½, 85, 86¼, 87, 87⅛, 88⅛, 89, 89½, 90, Croydon sliding-scale 112, 113, max. div. 87, European 8½, 8⅝, 8⅜, Gas Light and Coke 18s. 9d., 18s. 10½d., 18s. 11¼d., 3½ p.ct. max. 64, 4 p.ct. pref. 80½, 3 p.ct. deb. 61½, Oriental 113, Primitiva 24s., 24s. 4½d., 24s. 6d., 24s. 9d., 24s. 10½d., 25s., 4 p.ct. deb. (1911) 80, South Metropolitan 107, 107¼, 107⅜. Supplementary prices, Gas Light and Coke 5 p.ct. deb. 1952-57 100⅜, 101.

On Wednesday, Bournemouth 7 p.ct. 12⅜, 6 p.ct. pref. 11⅜, British 116½, 117, Commercial 3 p.ct. deb. 60, Continental Union 87, 87½, 87⅞, 88, 88¼, 89, 89½, 89⅜, 90, Croydon max. div. 86, Gas Light and Coke 18s. 9d., 18s. 10½d., 18s. 11¼d., 3½ p.ct. 64, 4 p.ct. pref. 80, 81, 3 p.ct. deb. 61½, Imperial Continental 180, 185, 186, 188, Maidstone 5 p.ct. 125, 125½, Newcastle 4 p.ct. pref. 71½, 72, Oriental 115, Primitiva 24s. 9d., 24s. 10½d., 25s., 25s. 1½d., 25s. 3d., South Metropolitan 107, 6½ p.ct. deb. 102. Supplementary prices, Brighton and Hove 4 p.ct. "C" pref. 70, Gas Light and Coke, Brentford 7½ p.ct. mort. 101½, Hornsey new 5 p.ct. pref. 89. Liverpool 5 p.ct. 90¼.

On Thursday, Continental Union 95, 96, 97, 97½, 98, 98⅜, 99, 99½, 99¾, 100, 102, 102½, 103, 104, 105, European 8⅜, Gas Light and Coke 19s., 3½ p.ct. 63½, 4 p.ct. pref. 78½, Imperial Continental 183, 190, Metropolitan (of Melbourne) 5½ p.ct. deb. 101, 101¼, Primitiva 25s. 4½d., 25s. 6d., 25s. 7½d., 25s. 9d., 26s., South Metropolitan 107, 107¾, 108, Wandsworth (Wimbledon 5 p.ct.) 111⅜. Supplementary prices, Bournemouth 7 p.ct. deb. 103½, Brighton and Hove 7 p.ct. deb. 104, Gas Light and Coke 5 p.ct. deb. 1952-57 100⅜, Hong Kong and China 5 p.ct. deb. 87⅜, Liverpool 5 p.ct. 91½.

On Friday, Bombay 22s., Commercial 99⅞, 100⅛, Continental Union 102, 104, 106, 106½, 107, 107½, 108, 109, 109½, 110, Croydon sliding-scale 112, European 9¼, Gas Light and Coke 18s. 7½d., 18s. 9d., 18s. 10½d., 18s. 11¼d., 3½ p.ct. 64½, 3 p.ct. deb. 60 *ex* div., 5 p.ct. deb. 100⅜, *ex* div., Imperial Continental 190, 190½, 191, 192, 195, 200, 201, 202, Primitiva 26s., 26s. 1½d., 26s. 3d., 26s. 4½d., 26s. 6d., 26s. 7½d., South Metropolitan 107, 107¼. Supplementary prices, Bristol 4 p.ct. new deb. 74, Gas Light and Coke 5 p.ct. deb. 1952-57 100⅜, Liverpool 5 p.ct. 90¼, Rochester, Chatham, and Gillingham 8 p.ct. deb. 103, Tottenham 5 p.ct. mort. 99⅜.

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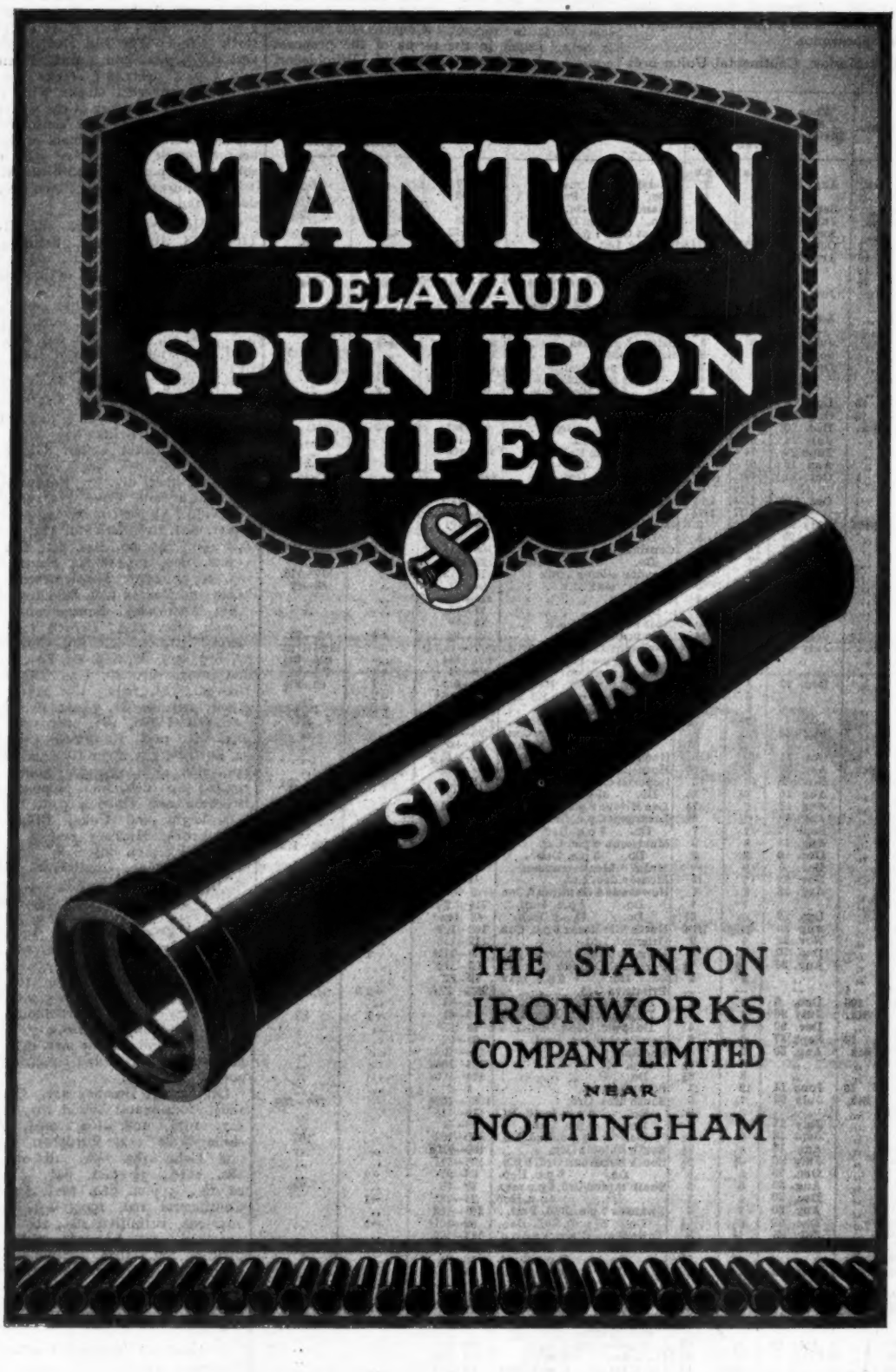
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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXXXIV. No. 3423.] LONDON, DECEMBER 26, 1928. [80TH YEAR. PRICE 1s.

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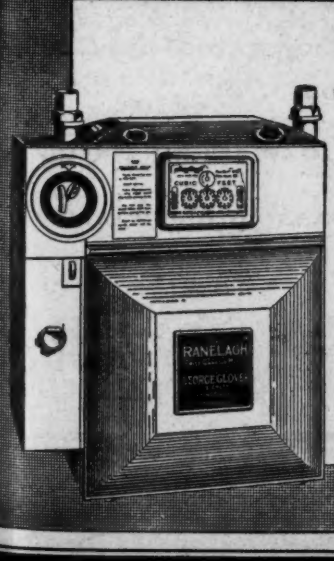

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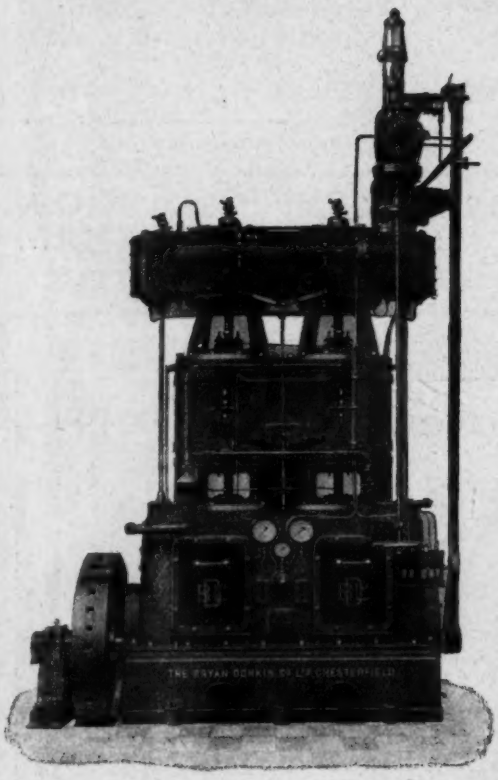

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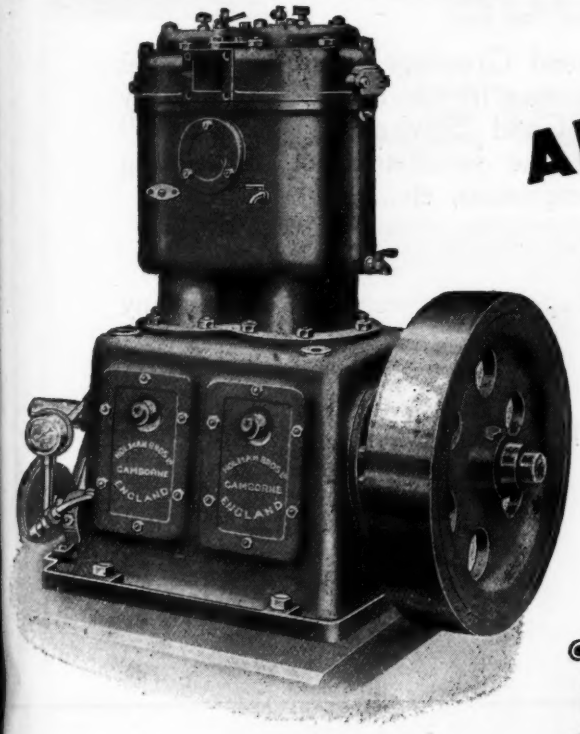

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Fig. 808. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

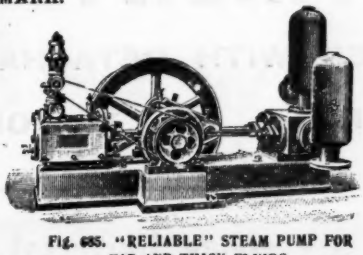

Fig. 655. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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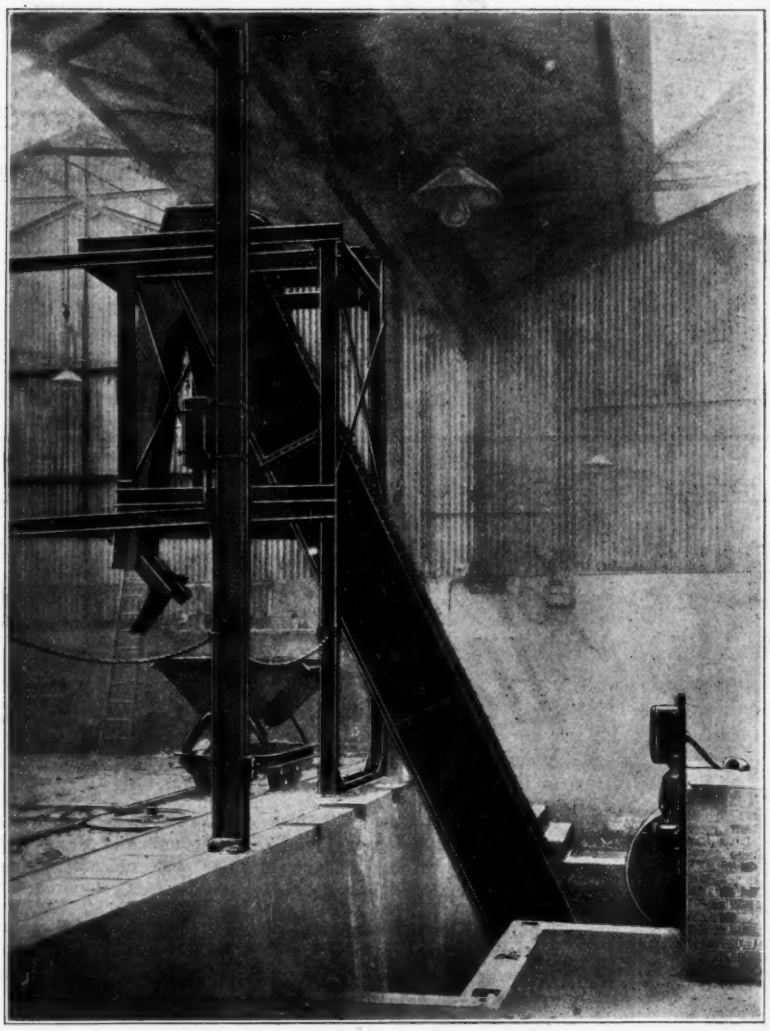

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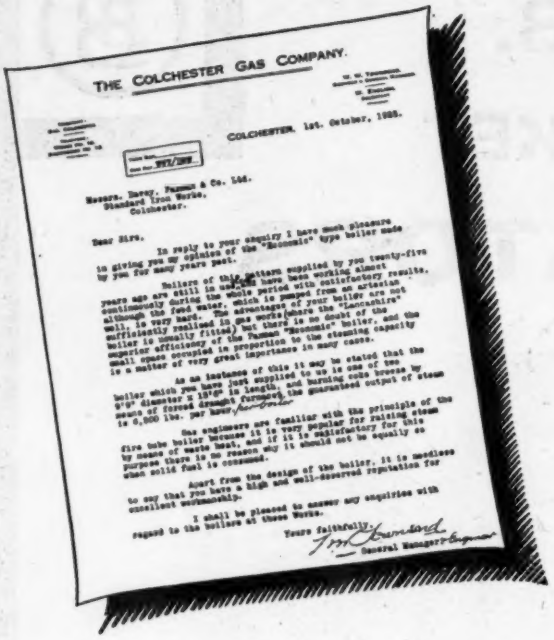
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General Manager-Engineer

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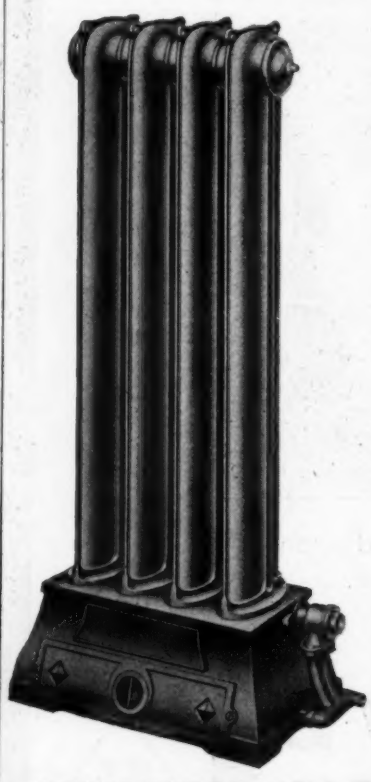

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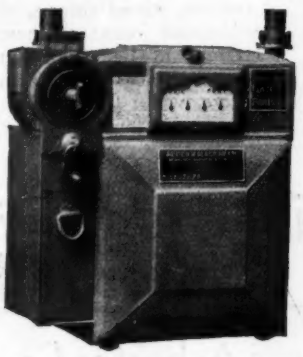

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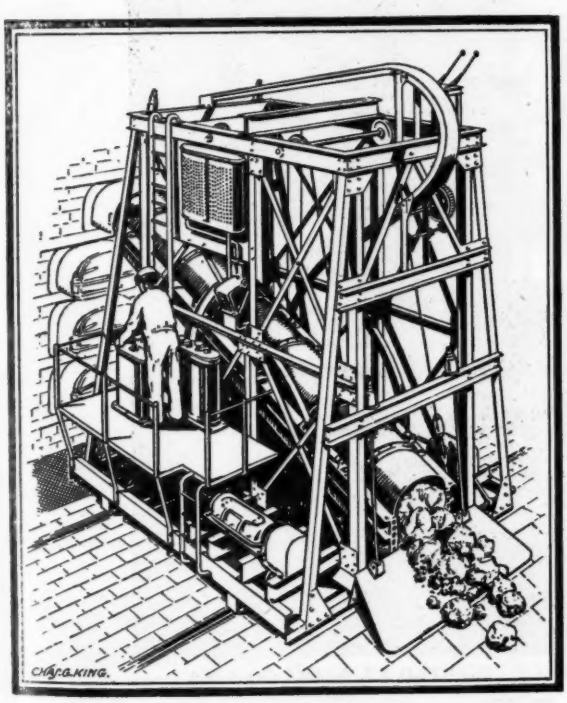

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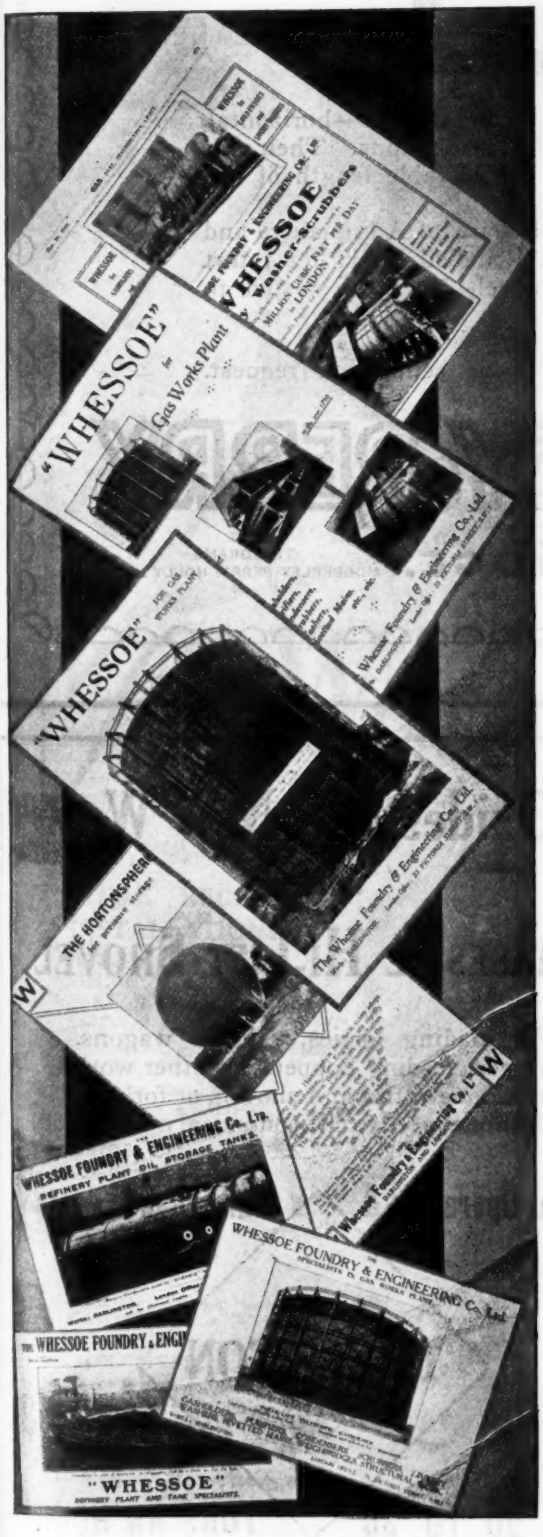

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Column Guided – Spiral Guided – Hortonspheres

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For Ammonia, Naphthalene, Cyanogen, and Benzol Extraction

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All types and systems, each designed for individual needs

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Separate boxes or complete sets, buildings, and valves

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RETORT SETTINGS

Our special B.B. quality Retorts are second to none—horizontal, vertical or inclined, to New Standard Specifications. Their very high refractory quality gives them considerable length of life.

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Quotations and samples will gladly be sent upon request.

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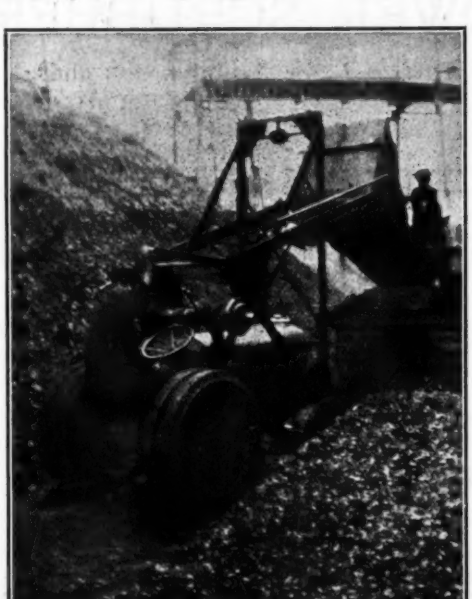

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Total Operating & Maintenance Costs

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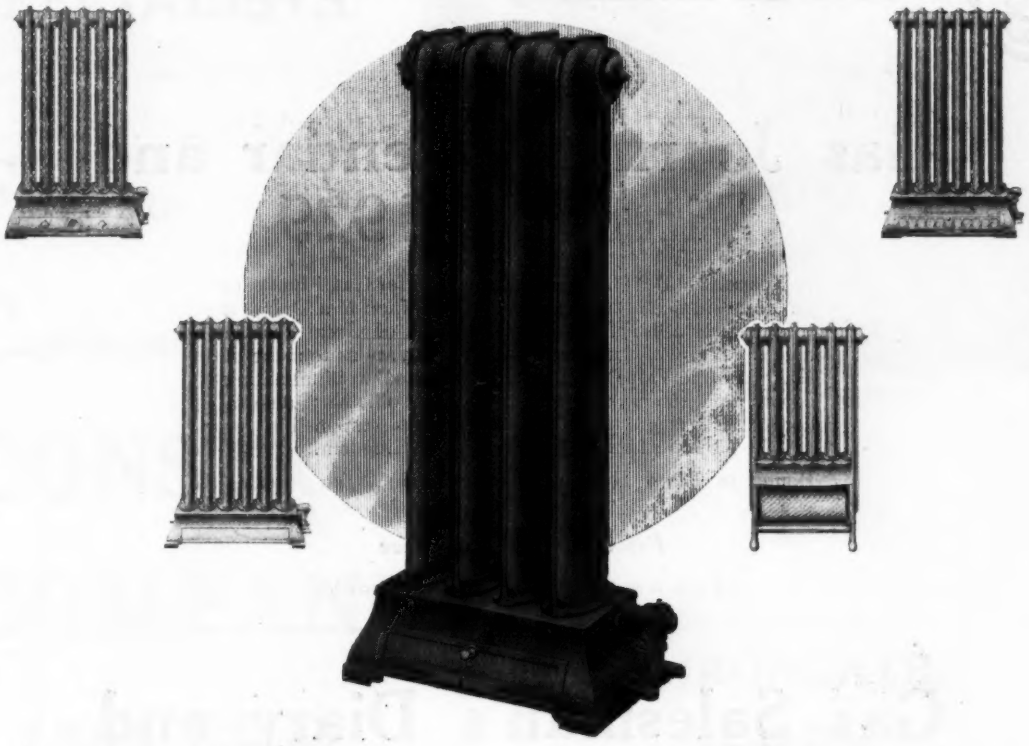

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SOME RECENT INSTALLATIONS.

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The problem of warming Public Buildings, Churches, Shops, Hotels, etc., is solved by installing Arden Hill's "Regulo"-controlled Gas Radiators. These Radiators are efficient—inexpensive to instal and economical in use.

These Radiators are fitted with the "Regulo" automatic gas-control for maintaining heat at an even temperature. With the "Regulo" the building is always kept comfortably warmed, with a healthy heat, neither humid nor oppressive.

ARDEN HILL'S

"REGULO"-CONTROLLED

GAS RADIATORS

ARDEN HILL & CO., ACME WORKS, ASTON, BIRMINGHAM

(Radiation Ltd., Proprietors)

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Gas Journal Calendar and Directory, 1929

A compendium of Valuable Information for Gas Engineers on both sides of the Industry. In addition to a Diary, it incorporates a list of Gas Undertakings of Great Britain and Ireland, with latest available particulars as to make of Gas, Calorific Value (declared and supplied) or illuminating power, and the names of responsible officials; also a list of Engineers and Superintendents responsible for Public Lighting in the United Kingdom.

Bound in Limp Rexine, 7 in. × 4⅝ in., with rounded corners.

Price* 7/6 *Post free

[A copy is sent to all "JOURNAL" subscribers.]

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Gas Salesman's Diary and Handbook, 1929

In addition to the Diary (specially ruled for Outside Salesmen), useful information for Gas Salesmen is dealt with in nine sections. A list of the Officers and Members of the B.C.G.A. Gas Salesmen's Circles is included.

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The Electrical Fusion of Gas Pipes

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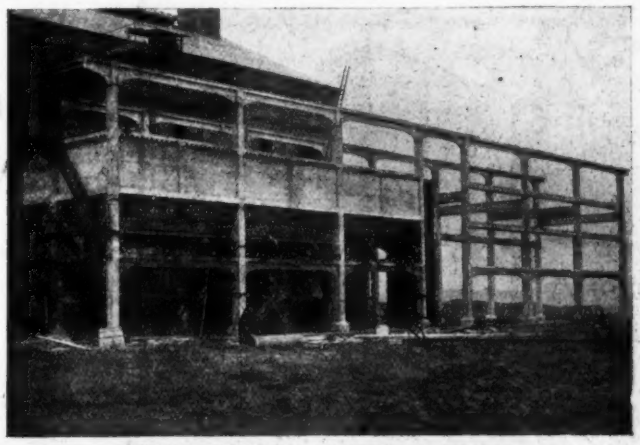

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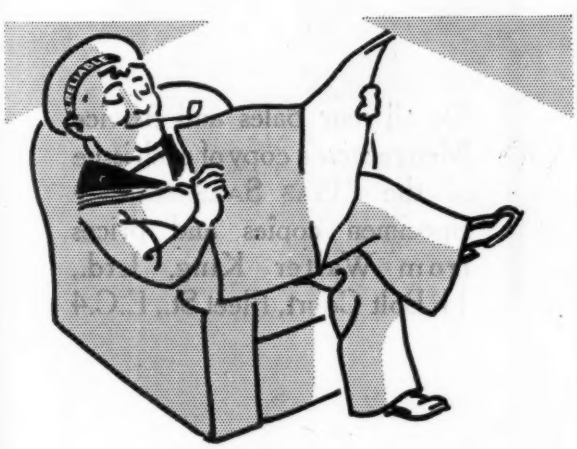

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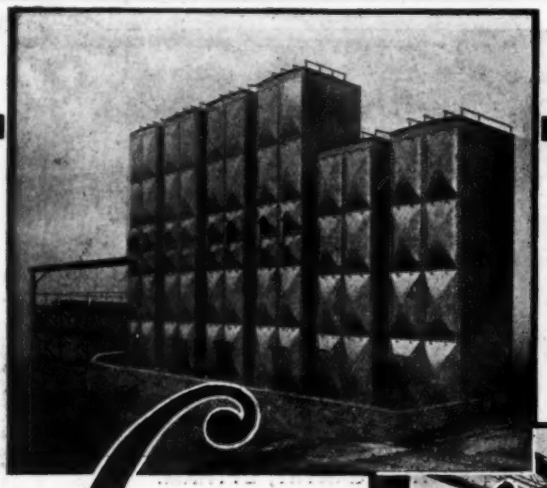

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Condensers of all Capacities and Types

Reprinted from the
"DAILY DISPATCH," THURSDAY, MARCH 29, 1928.

A WIZARD OF GAS AND WATER.

BOILER MARVEL OF OUR EXHIBITION.

In pursuing the way to cleaner homes and cleaner cities, the *Daily Dispatch* Health and Hygiene Exhibition in the City Hall, Deansgate, Manchester, is bringing nearer to realisation an ideal that is to-day neither visionary nor distant.

Few demonstrations are more absorbing than that of the Town Gas Boilers (Bonecourt), Ltd.

The working of a modern laundry, which has been in operation since the Exhibition opened, riveted the attention of many hundreds of people throughout the day. These were surprised to learn that the whole plant was being worked by one boiler which had been running since early morning entirely without supervision.

GAS AND WATER WIZARD.

This was a splendid example of a Bonecourt gas-fire boiler, one of the most amazing labour-saving devices in existence. It requires no attendant, and regulates gas and water by itself.

"There are a hundred of these boilers now in use in Lancashire alone," the *Daily Dispatch* was told by an expert. "They have found immediate favour by reason of their high efficiency, their cleanliness, and their simplicity. The boiler, which works the jam factory as well as the laundry demonstration, is started in the morning and goes on of its own accord until we close down."

This "intelligent" machine may be used for any purpose for which steam is required.

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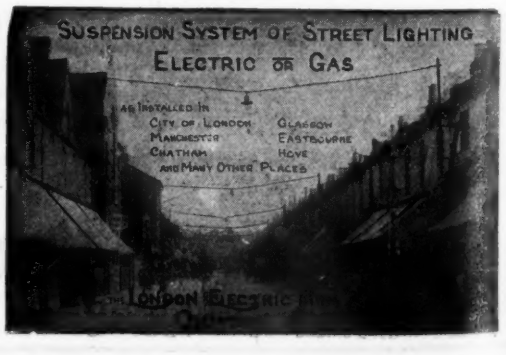

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NEW DESIGNS OF EXTREME MERIT

Incomparable as the "Sunbeam" has been for many years, the new designs invite more than usual admiration. Whilst it has always been the special "Wilson" care to preserve, and to increase, the working efficiency of the fire, the appearance has been greatly enhanced: and in particular the graceful design of the "Dogs" helps an ensemble that is bound to attract favourable attention in the Showroom.

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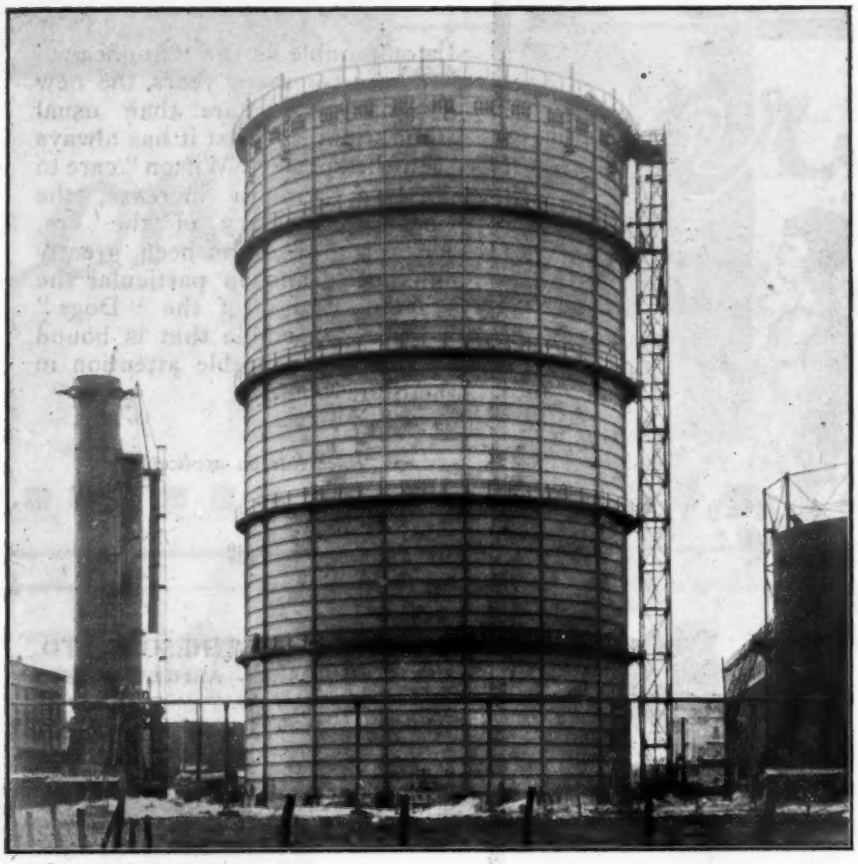
SIMPLE, RELIABLE, AND ECONOMICAL



ENTIRELY AUTOMATIC IN ACTION. LESS COSTLY FOUNDATIONS.
NO PUMPS. NO ATTENDANCE. SUITABLE FOR ALL CLIMATIC CONDITIONS.

EIGHT GASHOLDERS IN OPERATION AND IN COURSE OF CONSTRUCTION.

THE LAST WORD IN TANKLESS GASHOLDER DESIGN.

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IMPROVED MECHANICAL SULPHATE PLANT

Show Substantial Profits with Sulphate at Present Price.

REVOLUTION IN SULPHATE OF AMMONIA MANUFACTURE

LABOUR CHARGES HALVED BY:—

(i) Salt handled mechanically from SATURATOR TO STORE.
(ii) Loading charges reduced — salt automatically bagged and weighed.

MAINTENANCE COSTS REDUCED BY:—

(i) Abolition of high speed machinery—NO High Speed moving parts resulting in less wear and tear, and reduction in cost of insurance.
(ii) Increased facilities for keeping plant clean, every part accessible.

GUARANTEED INCREASED EFFICIENCY

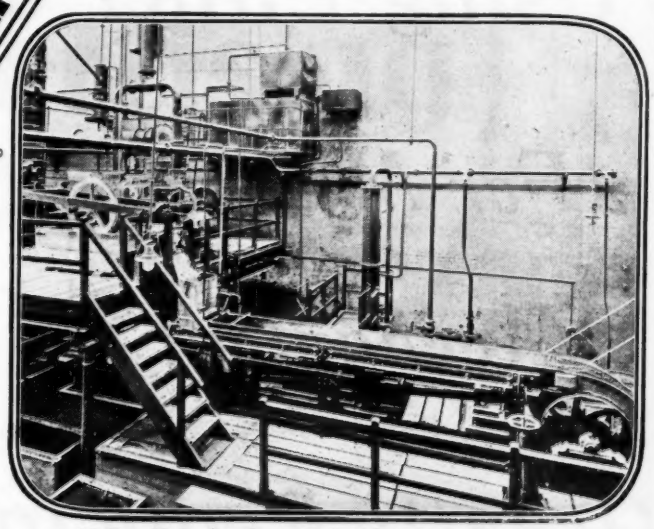
(i) The amount of steam used per gallon of liquor distilled is only ONE HALF that previously used resulting in a saving of 15s. per ton on cost of salt made.
(ii) The quality of salt made meets the specification of the Sulphate of Ammonia Federation for:
(a) Nitrogen content.
(b) Free Acid.
(c) Moisture content.
(d) Neutrality.
(e) Size of Crystal.

NO PYRIDENE SMELLS

(i) Pyridene can be recovered if required and sold at good profit.

WE GUARANTEE OUR PLANTS AND SAVING TO BE MADE.
OUR ENGINEERS ARE ALWAYS AVAILABLE AND WE WELCOME YOUR REQUEST FOR US TO VISIT YOU AND SHOW YOU HOW IT IS DONE.

This plant is Applicable to the Synthetic Process.



12-Ton Unit already erected and in operation at Granton Gas Works, Edinburgh.

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Perfected Plants & Processes

Using Either Coke or Coal

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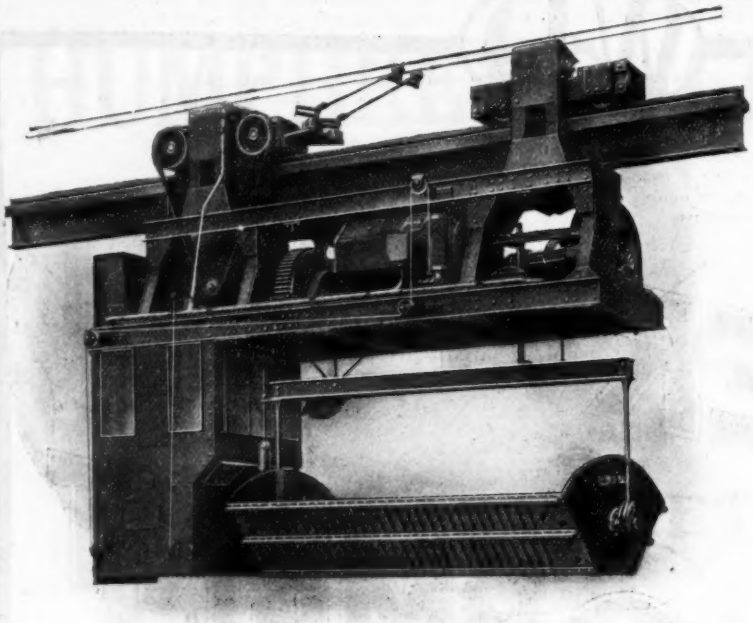
The WOODALL-DUCKHAM VERTICAL RETORT & OVEN CONSTRUCTION CO.(1920)LTD.



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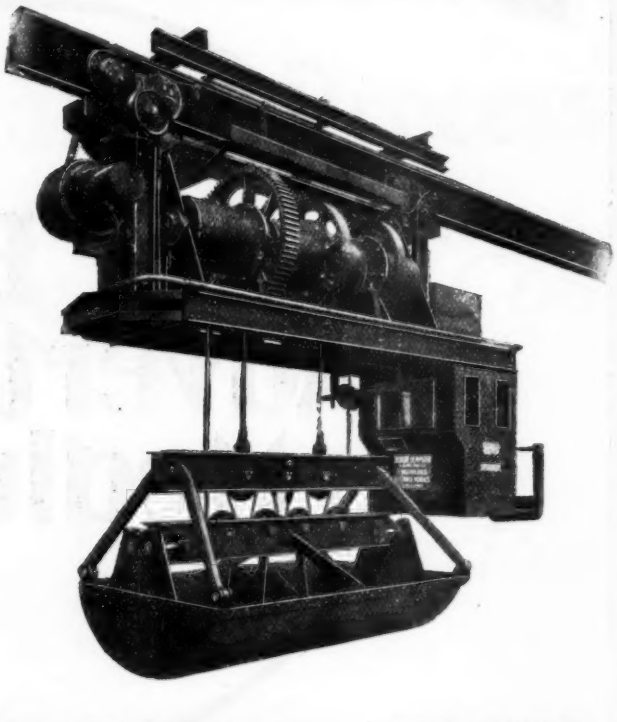

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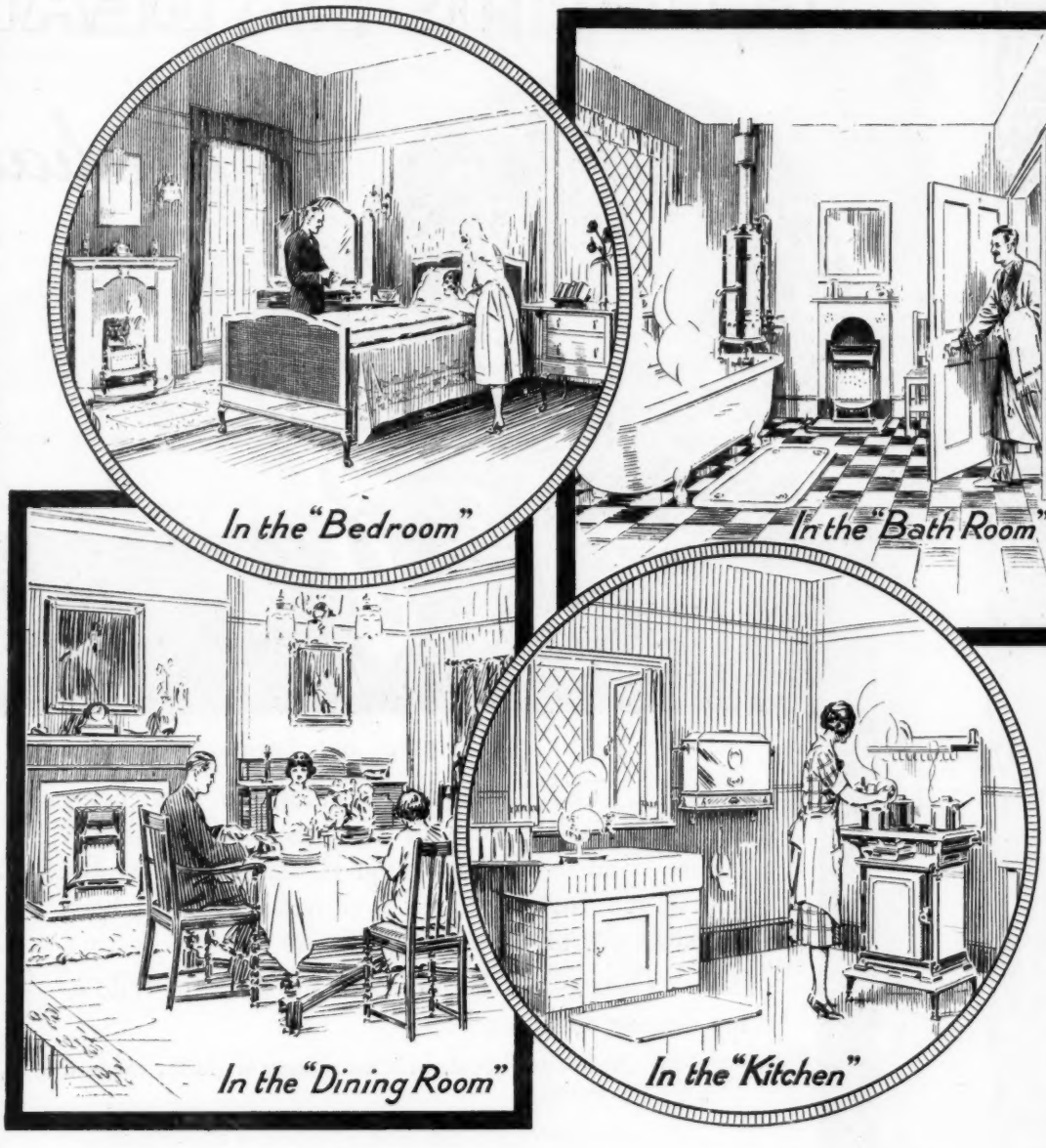
The Parkinson Stove Co. Ltd

Parkinson Hygienic Gas-Appliances

WILL HELP TO INCREASE YOUR SALES for 1929



THE progress and expansion of all Gas Undertakings, in common with other commercial interests, are based directly upon Sales which, proportionate with their growth, are indicative of sound and efficient organization. Parkinson Gas Cooking, Heating, and Hot Water Appliances are reliable factors in the promotion of showroom business, because every user of a Parkinson Appliance is a satisfied gas consumer.

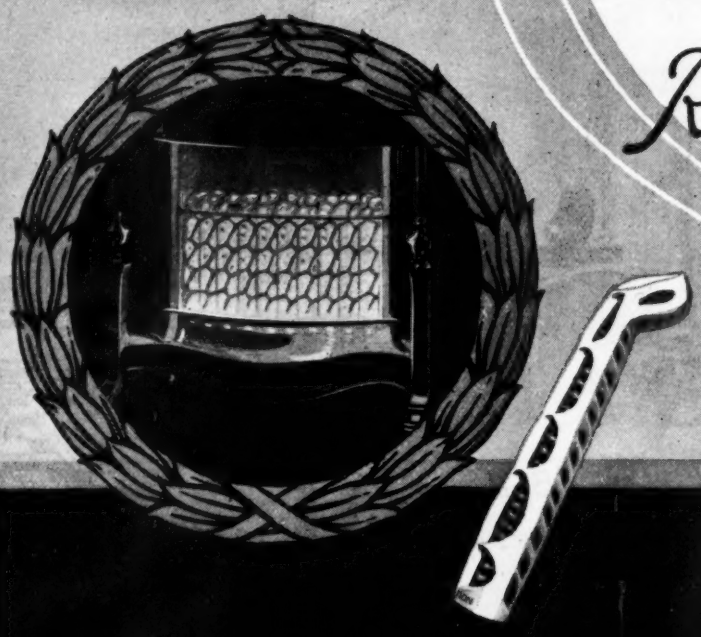
Write for complete list of Gas Heating, Cooking, and Hot Water Apparatus to:

THE PARKINSON STOVE CO., LIMITED.

LONDON: 8 & 10, Grosvenor Gardens, Victoria, S.W.1. **BIRMINGHAM:** Stechford Wks.
MANCHESTER: Victory Wks., Stretford. **GLASGOW:** 13/27, S. Shamrock St., S.S.
BELFAST: Mornington St. Wks. **DUBLIN:** 7, Hanover St., East.

Birmingham, London etc.

"THERMO-XX BEAM" Radiants



RADIATION Standard Grates are now being sent out fitted with the new "Thermo-XX Beam" Radiants. With these Radiants more visible and short infra-red energy is provided than has been available previously with the gas-fire.

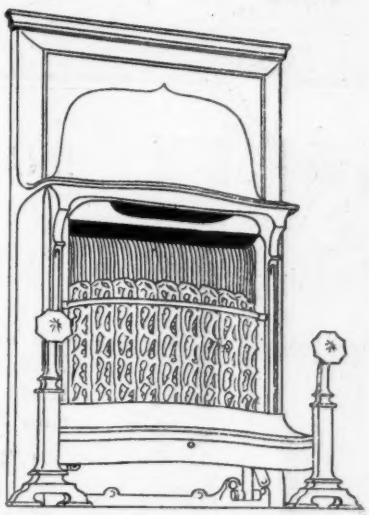
The "Thermo-XX Beam" Radiant gives the following definite advantages :—

(1) A "softer" heat, with a sensation of greater comfort, is attained ;

(2) A brighter fire and more attractive in appearance ;

(3) The fire heats up more rapidly.

The Radiation Gas Grates have two openings under the canopy leading to the flue. The lower or "Injector" opening carries away the entire combustion products, and the upper or "Ventilating" opening carries away a large volume of air drawn from the room. The ascending current through the lower outlet promotes the ventilating function in the outlet above; the result is that while pure radiant heat is distributed throughout the room, the air of the room is changed a sufficient number of times to ensure an agreeable and healthy atmosphere being maintained, without draughts.



¶ The standardisation and complete interchangeability of parts that prevails among the gas grates manufactured by all the Radiation firms becomes of greater importance each year, as the range of designs, offered in the various illustrated lists, is periodically extended and improved.

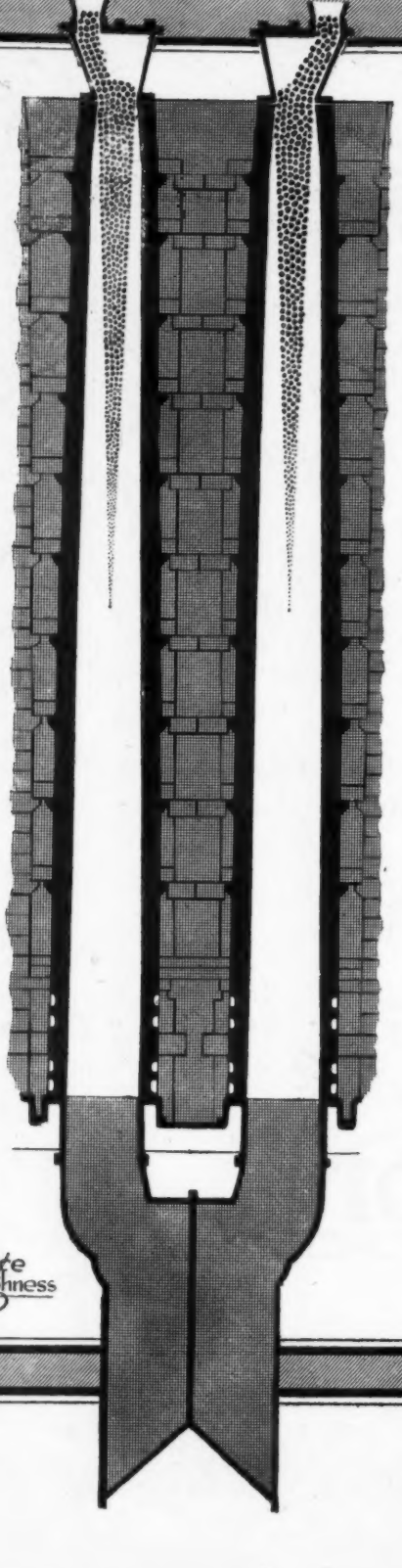
Gas Undertakings find it more and more to their satisfaction to be able to supply all the varied requirements of their districts from admirably-equipped sources.

The Public knows and thoroughly appreciates Radiation Gas Grates, that never fail to justify all the best claims made for gas as a domestic fuel.

—And Radiation Gas Grates "Ventilate as they Warm."

Radiation
LIMITED

DRAKES VERTICALS



DRAKES' VERTICALS DE LUXE

The System with the New Dustless Coke Discharge

(Patent applied for)

There is no magic about the designing and heating of a Vertical Retort Setting. As with Horizontal Carbonization, the fundamentals are merely KNOWING HOW. To ensure success one must have practical knowledge of:

1 The combustion, behaviour, and application of fuel gas to a heating proposition

2 How to choose and where to use the most suitable refractory materials, and:

3 How to build these refractories in substantial manner so as to secure stability and yet allow for differential expansion and contraction under working conditions

Ask yourselves these simple questions:

Why is there a total absence of tar trouble with a Drakes' Vertical Plant?

Why are the top working platforms so cool, and the working conditions for the men so excellent?

Why does the gas come off so cool, and why this general absence of top heat in spite of the Settings being saturated with a steady, soaking temperature roundabout 1450° Centigrade?

Why do all Drakes' Plants work as regularly as the tick of a clock, not sometimes, but ALL the time?

It all comes about through simply KNOWING HOW and this is where Drakes' FOUR-SCORE YEARS of accumulated practical experience is of paramount importance to YOU

Service and Thoroughness

Drakes Limited
HALIFAX
YORKS

Telephone: 2741 Halifax (5 lines) (Day and Night)
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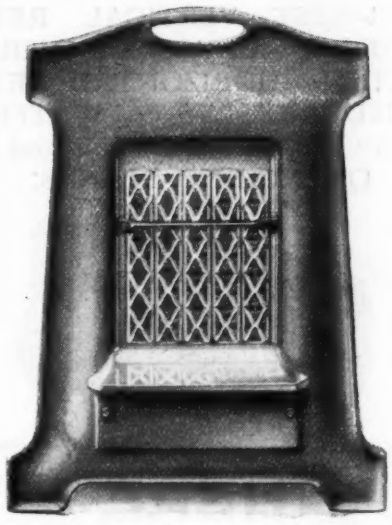
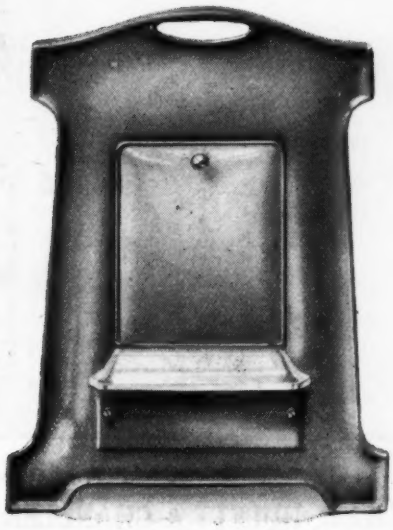
A New Design with a Dual Purpose



A Gas-Fire in Winter



A Fire-Screen in Summer

The MAINSCREEN Fire can be installed without disturbing any part of the existing fireplace, and can be removed at any time to another apartment where there is a gas supply. No building-in or fitting is required.

Write for full particulars and illustrated lists.

The

MAINSCREEN

Portable Gas-Fire

MADE BY

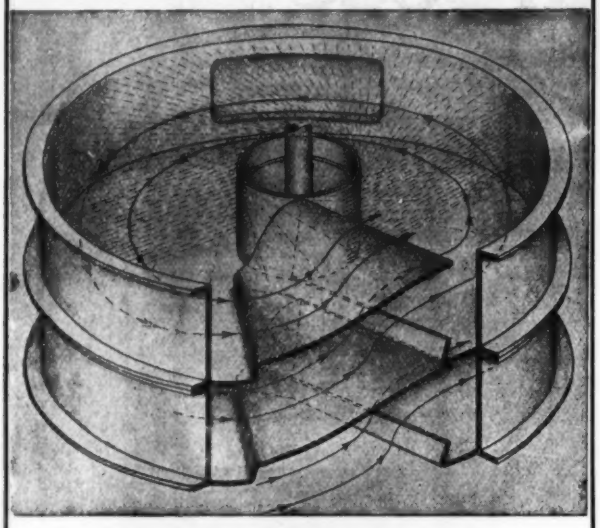
MAIN

A New Departure in Gas Washers

The Patent "Spiral Standard" Centrifugal Washer

**Spiral Travel of Gas,
Increased Time Contact
& consequently Efficiency**

REDUCED HORSE POWER. REDUCED BACK PRESSURE.

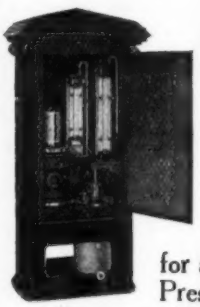


View of 2 Sections showing Spiral Travel of Gas.

KIRKHAM, HULETT & CHANDLER, LTD.

37 & 38, Norfolk House, Norfolk St., Strand, London, W.C.2

Telegraphic Address: "Washer, Estrand, London." Tel. No.: 1343 City



THE
ORIGINATORS
OF
PRESSURE LOADING

It is only a matter of time for all Gas Companies to use Pressure Loaded Governors, either using air pressure from a small bell or the inlet gas pressure through a small pilot or auxiliary governor, either hand loaded or actuated by a clock.

You should investigate this simple system. We, the originators of Pressure Loading—the first patents were granted us in 1875—will be pleased to give you particulars of the latest developments of this efficient system.

PEEBLES & CO. LTD
Tay Works
Bonnington
EDINBURGH

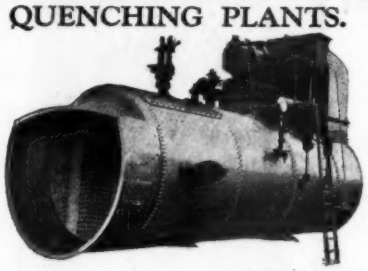
E.L.H.

"regarded as standard."

KIRKE
PATENT WASTE HEAT BOILERS

FOR

GLOVER-WEST VERTICAL RETORTS
ALL OTHER MAKES OF VERTICAL RETORTS · HORIZONTAL RETORTS
INCLINED RETORTS · WATER GAS PLANTS · CHAMBER OVENS and COKE QUENCHING PLANTS.



British Waste Heat Boiler
*Patents No. 130234 140851** 172752, 186801*, etc.*

HERE
is part of an edifying conversation heard recently.

Chief Engineer of a Gas Company enquiring of another as to the points of Kirke Patent Waste Heat Boilers:

"Do you find the upkeep of these boilers expensive and do they pay?"

Chief Engineer of Gas Company already using Kirke Waste Heat Boilers:

"I put in two of them about three years ago and two more about two years ago. I haven't spent a sixpence on repairs and we have got back our capital 5 to 6 times over already."

The point is: Can you afford to ignore the existence of such a boiler? Why not let us instal them on your settings also?

SPENCER-BONECOURT
LIMITED

The Waste-Heat Recovery Specialists,

50-64 BROADWAY, WESTMINSTER, S.W.1.
'Phone: VICTORIA 2802-3.
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A WONDERFUL

reserve of life

has been proved

in our

HIGH CAPACITY METER

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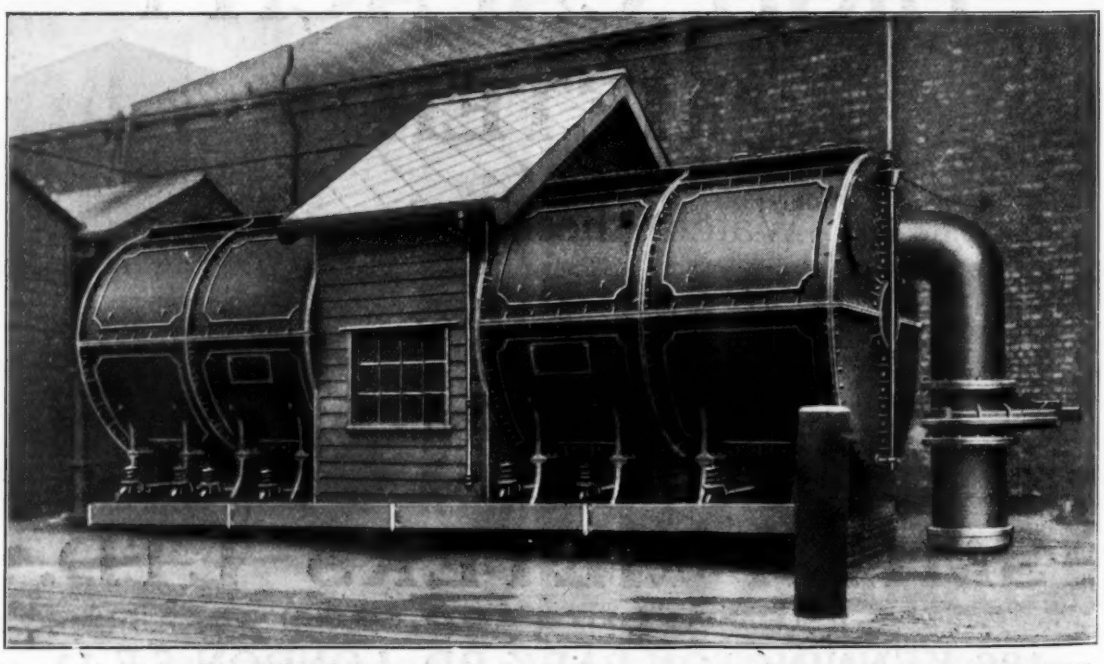

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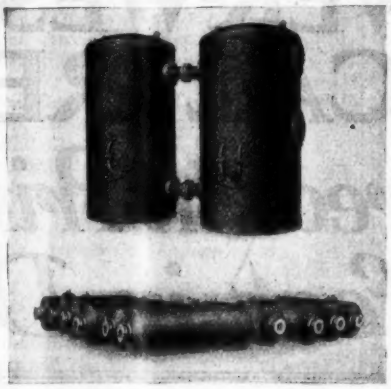

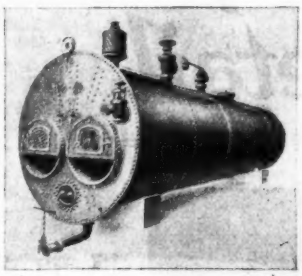

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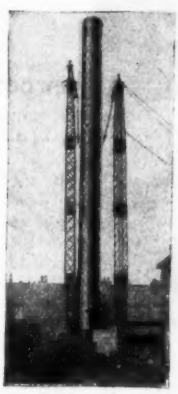

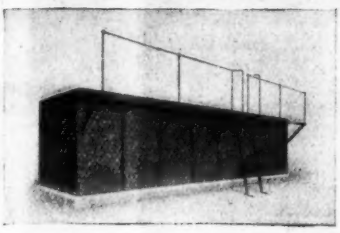

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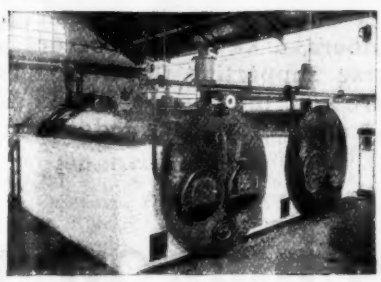

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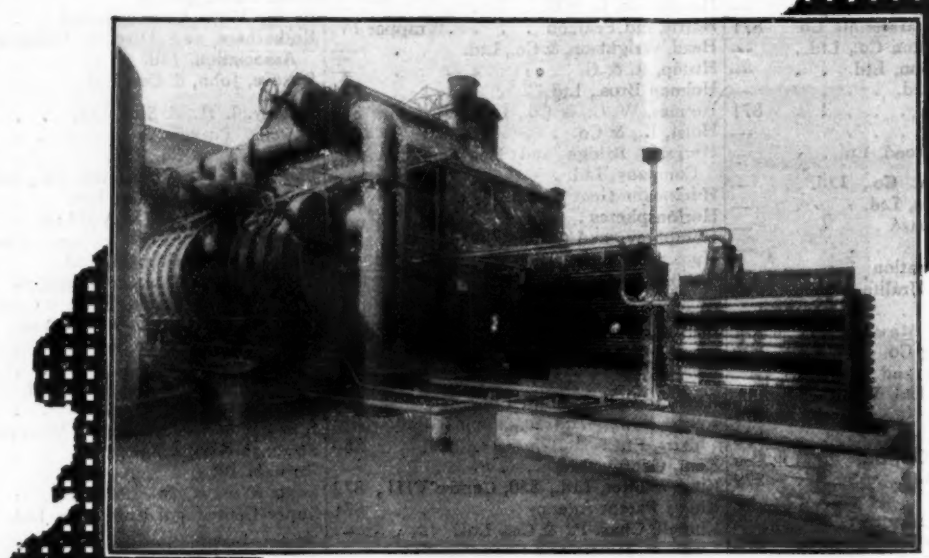

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Professor J. W. Cobb, C.B.E., B.Sc., F.I.C.

PRINCIPLES OF GAS DISTRIBUTION.
Mr. Stephen Lacey, B.Sc.

BY-PRODUCT COKING PROCESSES.
Mr. C. P. Finn, B.Sc., F.I.C., M.I.Chem.E.

METALLURGY.
Mr. P. F. Summers, A.R.S.M.

The Laboratory will be open on Wednesday evenings from January 9th to February 13th for students desiring instruction in Fuel Calorimetry and Pyrometry, and for more advanced students capable of independent work. Further Information may be had from THE REGISTRAR, THE UNIVERSITY, LEEDS.

CONTRACTS OPEN.

COUNTY BOROUGH OF WALLASEY.
(GAS-WORKS.)

TO COLLIERY PROPRIETORS AND OTHERS.

THE Wallasey Corporation are pre- pared to receive TENDERS for the Supply of 62,000 Tons of GAS COAL and NUTS over a period of Twelve Months, to be delivered in accordance with the Terms and Specification and General Conditions prepared by, and to be obtained at the Office of, the Engineer, Limekiln Lane, Wallasey.

Sealed Tenders, addressed to the undersigned, and endorsed "Tenders for Gas Coal and Nuts," to be delivered per post at my Office, as below, not later than the morning of Tuesday, the 15th of January, 1929.

The Contractor or Contractors may be required to enter into a Contract with approved Sureties for the due performance of the Contract.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
GEO. LIVSEY,
Town Clerk.

Town Hall,
Wallasey,
Dec. 19, 1928.

COWES URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply, Delivery, and Erection of a WATER-SEALED GASHOLDER of 250,000 c.ft. capacity, complete with Foundations, Tank, Inlet and Outlet Valves, and Syphons, and to throw a minimum pressure of 8 in.

Tenders to be for holder constructed in Steel, Wrought Iron, and Armco Iron.

Complete Drawings and Specifications of Materials and Design (including analysis of wrought iron) to accompany the Tenders, which must be addressed to "The Chairman of the Gas Committee," Gas-Works, Arctic Road, Cowes, endorsed "Tenders for Gasholder," and reach here not later than the 19th of January, 1929.

The site of the proposed holder may be inspected.

The Council do not bind themselves to accept the lowest or any Tender.

R. A. GRETTON,
Engineer and Manager.

COMPANY NOTICE.

THE GAS LIGHT AND COKE COMPANY.

NOTICE is Hereby Given that the TRANSFER BOOKS of this Company, SO FAR AS THEY RELATE TO CAPITAL STOCKS, WILL BE CLOSED at 4 o'clock p.m. on Tuesday, the 8th day of January next, and will be RE-OPENED immediately after the Ordinary General Meeting of the Company to be held on Friday, the 8th day of February next.

Dividends payable in respect of the Half-Year ending the 31st inst. will be remitted by Warrant forwarded by post on the 28th of February, 1929, to those Proprietors who were the Holders of Capital Stocks when the Transfer Books were closed, or their Authorized Agents.

By order,
WILLIAM LYLE GALBRAITH,
Secretary.

Chief Office:
Horseferry Road,
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Dec. 21, 1928.

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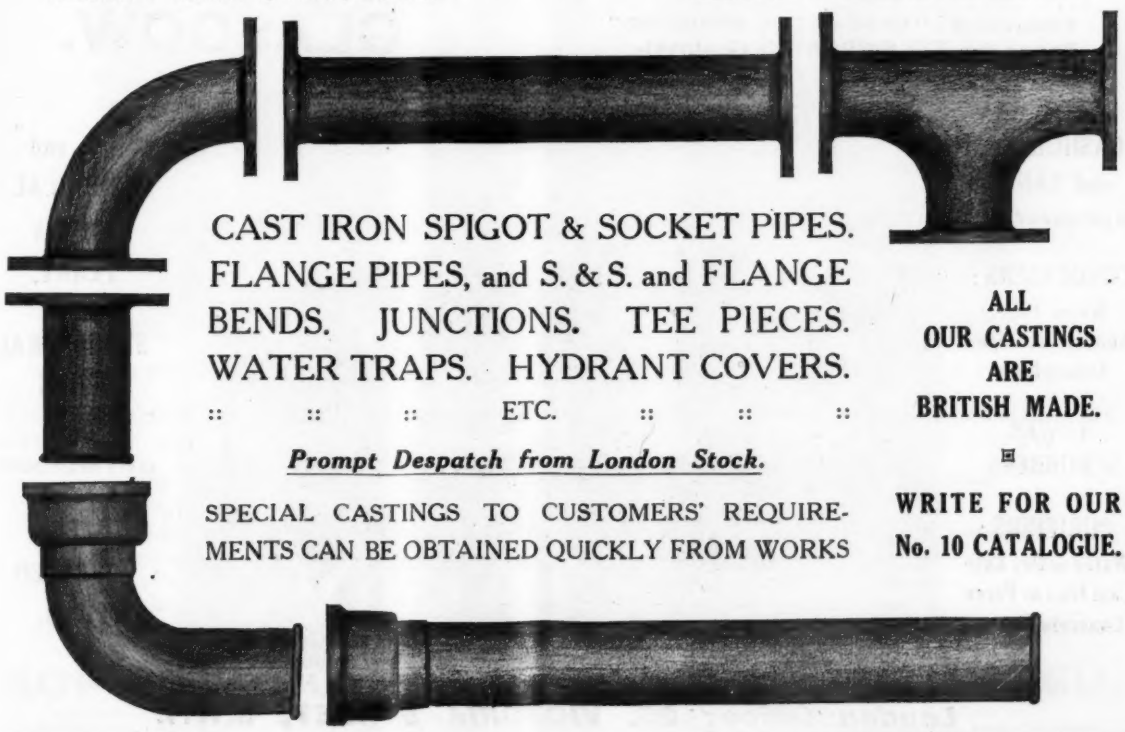

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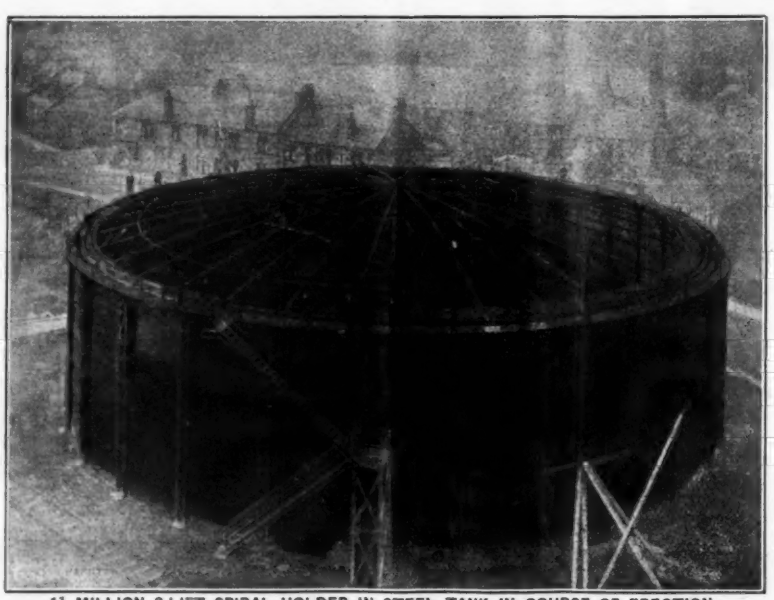

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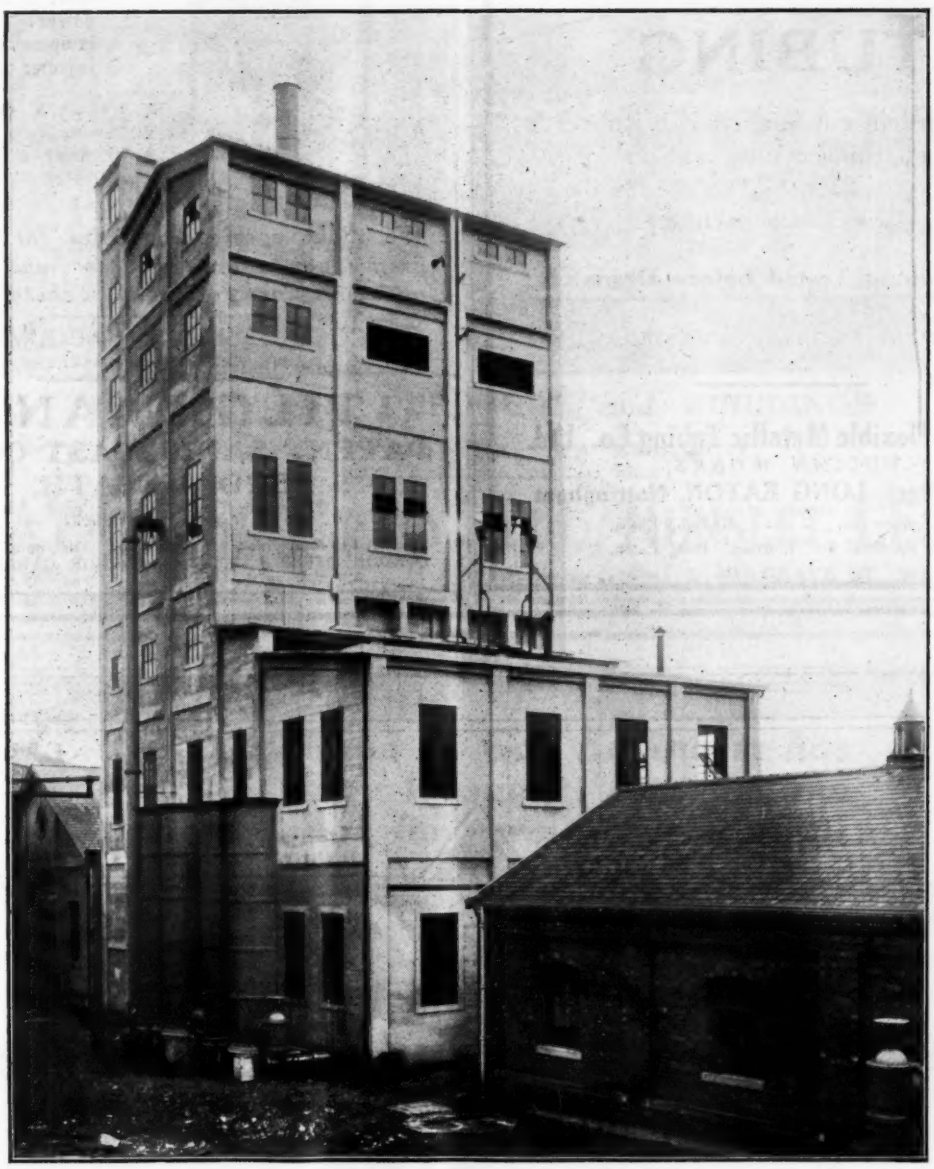

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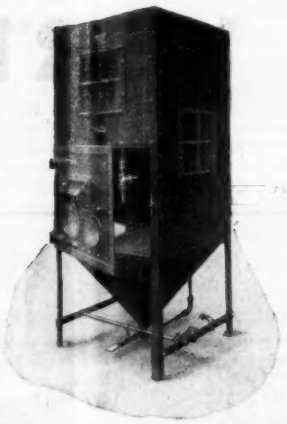

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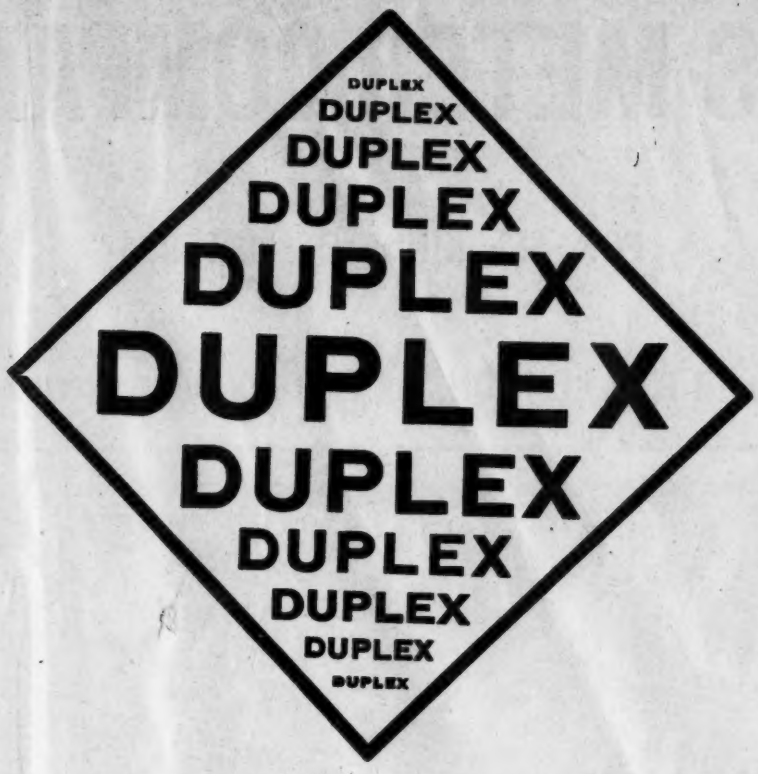

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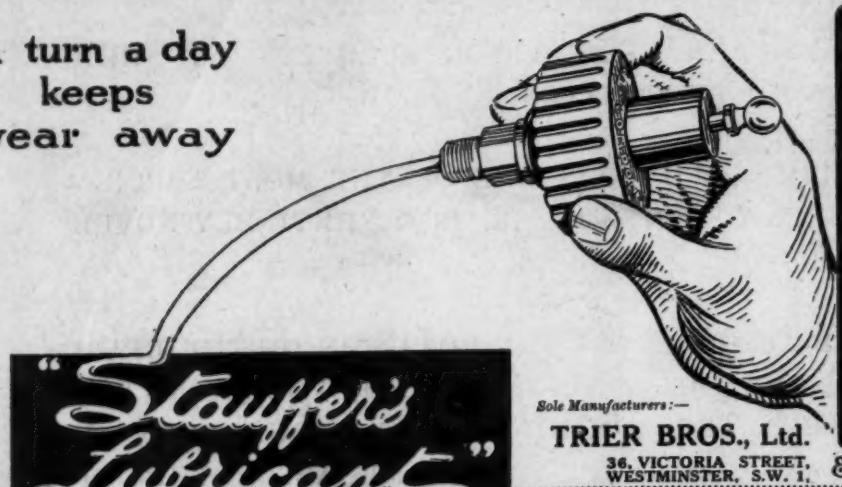

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